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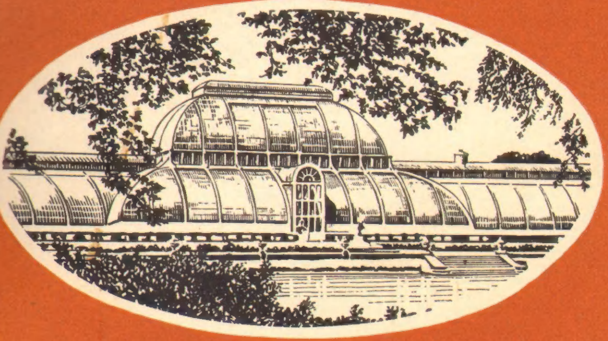

The Royal Botanic Gardens Kew

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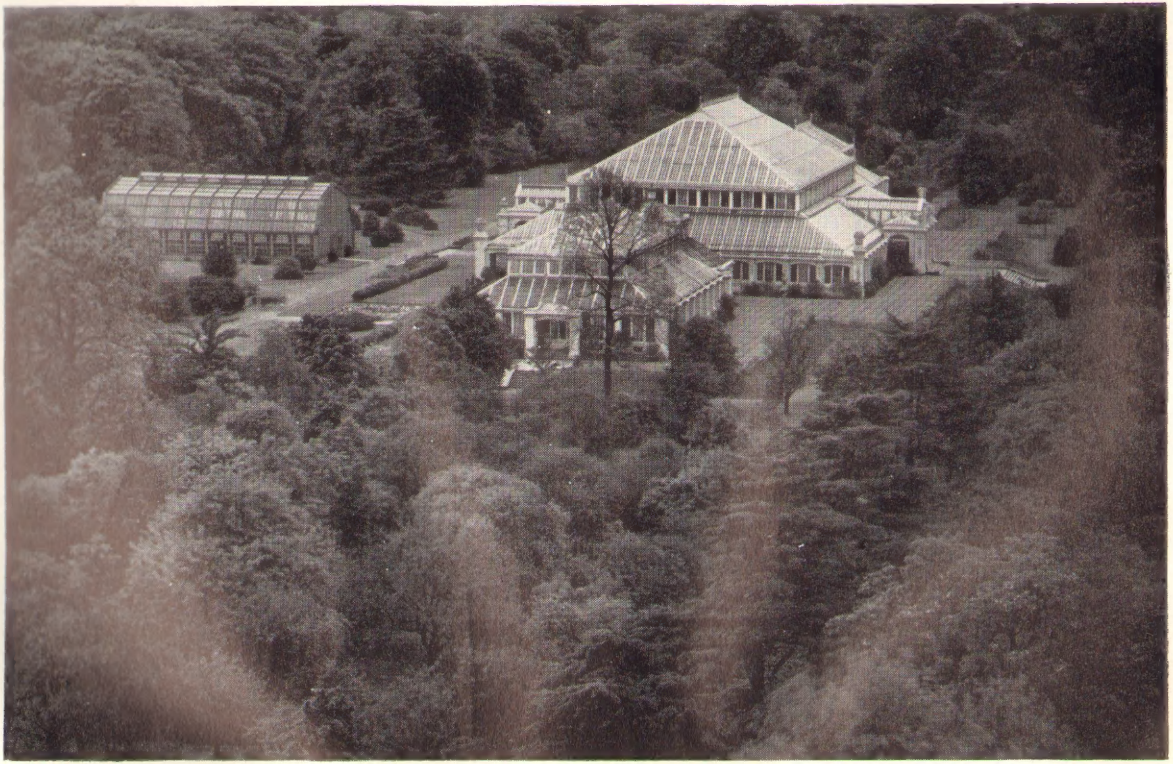
THE ROYAL BOTANIC GARDENS



Temperate House and Australian House

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The Royal
Botanic Gardens
Kew

ILLUSTRATED GUIDE

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1937–	W. M. Campbell, N.D.H., F.Inst.P.A. (Curator of Living Collections)

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Introduction

THE Royal Botanic Gardens cover an area of about 300 acres and are situated on the east bank of the Thames just above Kew Bridge in the County of Surrey. The eastern boundary is Kew Road, which, it is interesting to recall, was made by George III in return for the closing of the ancient right of way from Richmond to Brentford. This old bridle-way followed closely the present-day Holly Walk, which at one time divided the two royal properties, subsequently united under George III. On the west a sunk fence or haha on the bank of the Thames is the boundary. To the south the Gardens are bounded by the Crown lands known as the Old Deer Park (now leased to the Royal Mid Surrey Golf Club). The northern boundary is Kew Green.

The Main Gate, near Kew Bridge, is on the west side of Kew Green. Three other entrances, namely Cumberland Gate, Victoria Gate and Lion Gate, are situated on Kew Road, about one sixth, one third, and nearly one mile from Kew Green. On the other side of the Gardens there is also an entrance, Isleworth Gate, from the towpath opposite Syon House. All the above-named can be used for entrance and exit all the year round but Brentford Gate which leads on to Queen Elizabeth's Lawn, now used as a car park, is manned from just before Easter till the end of the summer only.

History and Functions of Kew

THE Botanical Gardens date back to 1759 when Princess Augusta initiated a botanical garden of about nine acres in extent in her private domain of Kew House, which was a venture of her own in a private capacity, and this explains how it comes about that the most famous botanical garden in the world is situated on a soil originally so infertile and sandy. Kew House which she occupied has long since disappeared, but it formerly occupied a position about 50 yards south-west of the Orangery. The Domain of Kew House occupied the area of the present gardens to the east of the road known as Love Lane which approximately followed the line of the present Holly Walk, and extended to the Thames ford. On the west side of this lane was the domain of Richmond Lodge which was occupied by Princess Augusta's son, George III. Richmond Lodge itself was situated in what are now the golf links, and the gardens of Kew House and Richmond Lodge were joined together to form the present botanical gardens, and hence the use of the plural. Nothing now remains of these two residences, and very few of the original old trees, but the ancient Maidenhair tree, *Ginkgo biloba*, is a survival from the botanic garden of Princess Augusta. She and George III, who inherited her tastes, were fortunate in their choice of helpers in the creation and maintenance of these gardens. The first Director, not in name, but in fact, was the Earl of Bute, a botanist of some distinction, and the Curator was one William Aiton, who served in that capacity for a period of 34 years. Bute was followed as unofficial Director by the famous Sir Joseph Banks, under whose direction the collections were greatly augmented, and the introduction of exotic plants was accelerated.

In the period prior to the handing over to the nation of the Botanic Gardens by the Royal family the collections were somewhat neglected, but in 1841 the Gardens were taken over by the State, and soon after the extensive gardens and parkland of the two properties were added for the purposes of the Royal Botanic Gardens, so that now the total extent is nearly 300 acres, inclusive of the Queen's Cottage grounds, which were presented by Queen

Victoria in 1897. These last with the proviso that they were to be maintained in their semi-wild state.

Several of the buildings which are at present in the Gardens were designed by Princess Augusta's architect, Sir William Chambers, who was responsible for designing the beautifully proportioned Orangery, a superb example of Georgian architecture, the Pagoda which serves so admirably as a landmark, and for the ruined arch on the east side of the Gardens, which is a relic of the romanticism of an earlier period.

To Chambers also we owe the Temple of Aeolus, the Temple of Bellona and the former Temple of the Sun, all dating from about 1760. King William's Temple is of a later design by Sir Jeffrey Wyatville, built in 1837.

The greater part of the present gardens was developed by the two first Directors, Sir William and Sir Joseph Hooker, and during that period assumed much of their present form. More recent developments are the Rock Garden which was established in 1882, and very much enlarged in 1929, the Chalk Garden, the Clematis Garden near King William's Temple, and the Heath Garden near the Pagoda.

FUNCTIONS

Kew Gardens, it must be remembered, primarily serve scientific purposes. The Institution has as its main objectives the accurate identification of plants and the provision of information in the field of botany, both pure and applied. In connection with the applied aspects the Institution has important functions, not only with respect to identification, but also in relation to the economic exploitation of plants. It is an important source of dissemination of botanical material either in the form of seeds or of living specimens to all parts of the Commonwealth, and indeed throughout the world, and has played a most important part in the development of the rubber industry, the cocoa industry and the introduction of other economic plants. With our increase of knowledge of the importance of safeguarding such distribution from being the means of disseminating diseases, Kew functions as a quarantine station.

By a large proportion of those who come to Kew, it is thought of rather as a place of recreation than as a scientific institution, but valuable as the former service is, it must be appreciated as a by-product of the Institution's main purpose, and therefore the usage of the gardens by the public must not be allowed to hamper its chief functions as a scientific establishment. Fortunately the proper safeguarding of the living collections and their efficiency is the best guarantee that the public will obtain the maximum enjoyment from them without detriment to botanical science.

The organisation of the Gardens for its main functions is under four headings.

1. In the extensive Herbarium and Library, which are not open to the public but are available for study to *bona fide* and fully qualified research workers, are housed millions of dried specimens which represent a permanent record of the characters of species that have been described by botanists in the past, whilst the library of some 55,000 volumes is perhaps the richest taxonomic library in the world. To consult these come botanists from all parts of the Commonwealth and from foreign countries. The Herbarium is in the charge of a Keeper, and is permanently staffed with a number of scientists, whose functions are mostly divided on the basis of geographical regions.

2. The second department includes the Economic Museums, where are housed collections of plant products of all types. These serve both for the purpose of research and also are important for the accurate identification of the multitudes of specimens which are sent in for that purpose. A certain proportion of the material of more general interest in the Museums is exhibited for public information.

3. The Jodrell Laboratory, which like the Museums has its own specialised staff, is concerned very largely with the internal structure of plants as a means of determination. Here extensive anatomical collections are maintained, and research carried out on taxonomic anatomy. The Museums and the Jodrell Laboratory are respectively in the charge of Keepers.

4. The fourth department of the Gardens comprises the living collections which serve to supplement in an important and material way the information which is provided by the Herbarium and Museums. The living collections are looked after by the Curator and a staff of Assistant Curators, under whose direction are the foremen and gardeners. The living collections comprise some 45,000 species and varieties and the surplus material available from these is utilized for purpose of research and for purposes of exchange. Exchange relations are established with all botanic gardens and in this way the maintenance of the collections is assured and research material is made available for students in universities throughout the world.

Landmarks

THE visitor unfamiliar with Kew will find certain features helpful to locate his position, such as for instance, the Lake, which is at the western side, the Palm House at the eastern side, whilst the Temperate House is situated towards the south. There are a number of structures which are of historic interest and which enable the visitor not sure of his surroundings to orientate himself, and in citing these the opportunity will be taken of mentioning any items of interest connected with them.

THE PAGODA

The Pagoda is situated in the south-eastern corner of the Gardens near to the Lion Gate. There is perhaps no other building in the Royal Gardens which excites so much interest or evokes so many questions. Owing to its height (163 feet) it can be seen from many parts of the Gardens, and a number of woodland rides radiate from its base.

The Pagoda was erected in 1761–62 to the designs of Sir William Chambers, who wrote a famous essay on oriental gardening, and was the architect of Somerset House. He executed many commissions for the Dowager Princess of Wales, Princess Augusta, some of which are still to be seen in the Gardens.

The building is octagonal in shape and is ten storeys high, the lowest storey being 26 feet in diameter and 18 feet high, above which each storey decreases one foot in diameter and one in height from the next below. It took not very much longer than six months to build, and the sturdiness of its construction stood up to the explosions of seven German bombs which fell all around it in 1941. At the time of its completion each of the eight corners of each of its ten roofs was decorated with an iron dragon covered with thin glass of various colours. The roofs, too, were covered with iron plates, varnished with different colours. These exotic additions have long since disappeared. The building is not open to the public.

THE FLAGSTAFF

The Flagstaff, originally 214 feet in height, offers a very prominent landmark. It is erected upon a mound, called Victory Hill, close to the North Gallery on the east boundary at a point about midway between the Victoria and Lion Gates. The Temple of Minden, or Temple of Victory, built to celebrate the victory of Minden, 1759, originally stood upon this mound.

The present flagstaff is the third to have been presented to Kew. The first was 118 feet high, and when being towed up the Thames from the London docks was cut in two by a tugboat. After being spliced it was brought again to the Gardens, but while being erected it and the hoisting apparatus were blown over and the spar broke into three pieces. Mr. Edward Stamp, who was the donor of this spar, on hearing of the disaster, immediately offered another and larger spar from his forests in British Columbia. A pole 159 feet high and 20 inches in diameter was eventually erected on this mound in 1861. This Flagstaff was replaced in 1919 by a still larger one, a gift to the Gardens by the Government of British Columbia. The existing Flagstaff, like its predecessor, is a shaped trunk of the coniferous tree known as Douglas Fir (*Pseudotsuga menziesii*) 2 feet 9 inches in diameter at the base, and 1 foot at the smaller end. In 1956, however, it was discovered that the top had been attacked by a wood-rotting fungus and 78 feet of it had to be removed. When this became known in British Columbia, the Government of that Province, together with certain business interests there connected with the timber trade, most generously donated another stem of Douglas Fir 225 feet in length, in commemoration of British Columbia's first centenary (1958) and Kew's bicentenary (1959).

Two young living specimens of Douglas Fir are to be seen on the slope to the north-west and about 30 yards from the Flagstaff.

KING WILLIAM'S TEMPLE

This temple, built on a mound about 150 yards north of the Temperate House, was erected in the reign of William IV, in 1837. At one time it contained a number of busts of members of the Royal Family, but these have been long since removed to Windsor. The inner walls are decorated with iron tablets bearing the dates and names of battles fought by British soldiers between 1760 and Waterloo.

TEMPLE OF BELLONA

This creation of Sir William Chambers, standing upon a slight eminence about half-way along the eastern side of the Gardens just south of Victoria Gate, was erected in 1760. It consists of a single rectangular room, covered with an elliptical dome, and fronted by a Doric four-columned portico. The walls inside are decorated with stucco festoons and medallions, on which are inscribed the names or numbers of various regiments.

TEMPLE OF AEOLUS

Just inside the Cumberland Gate on the summit of the wooded mound is the Temple of Aeolus. Erected by Sir William Chambers about 1761, it had fallen into a ruinous state some 80 years later. Sir William Hooker had it rebuilt in 1845 according to the original design. It consists of a hemispherical dome supported by eight columns, and its severely classical lines are particularly effective in its present setting.

TEMPLE OF ARETHUSA

This so-called Temple, another of Sir William Chambers' creations, is to be found close to the entrance to the Shaft Yard at the base of the Campanile or Water Tower. It is of classic design and serves to shelter tablets on which are recorded the names of members of the Kew who lost their lives in the First and Second World Wars.

THE RUINED ARCH

The Ruined Arch was designed and built by Sir William Chambers in 1759–60. His idea was to imitate a Roman antiquity, but the structure also had to carry a carriage-way from Kew Road into the grounds. The arches were built of brick faced with stone, but much of the latter has now fallen away, exposing the pitted brickwork.

CHOKUSHI MON

Close to the Cedar Vista (see page 73) and not far from the Pagoda is a small mound on the summit of which stands a replica of a famous Japanese gate: 'The Gateway of the Imperial Messenger' or 'Chokushi Mon'. This was one of the exhibits shown at the Japanese Exhibition at Shepherd's Bush in 1910, and was presented to the Gardens by the Kyoto Exhibitors' Association at the close of the Exhibition.

This beautiful and remarkable structure is worthy of attention because of the perfection of its proportions and for the exquisite delicacy of the carving.

The mound is called 'Moss' Hill, doubtless a corruption, from the fact that at one time there stood here another of Sir William Chambers' creations, the Mosque, which was demolished or fell into decay early in the 19th century.

MUSEUM I

Museum No. I is situated on the other side of the pond facing the Palm House. It was erected in 1857 and it is the only one of the four museums to have been designed as such; the architect was Decimus Burton (see page 101). Facing the Palm House the path to the left leads to the Victoria Gate, whilst that to the right-hand, turning right by the Museum, leads to the Cumberland Gate and nearest bus stop.

MUSEUM II

Museum No. II stands at the northern end of the Herbaceous Garden and faces the Aquatic Garden. It was originally used as gardeners' quarters and as a storehouse for the vegetables and fruit grown in the fruit and kitchen garden of Princess Augusta (see page 110).

MUSEUM III (WOOD)

Museum No. III is housed in Cambridge Cottage, formerly the residence of H.R.H. the Duke of Cambridge, situated to the north of the Duke's Garden, the old world garden behind the brick wall near the Aquatic Garden (see page 118).

THE ORANGERY

This magnificent building, one of Sir William Chambers' masterpieces, commissioned by Princess Augusta and erected in 1761, is situated near the Main Gate, at the northern end of the Broad Walk. After functioning for many years as a Museum it has now been restored to its original use. Among the statues which embellish the interior are two by the French sculptor, Pietro Francavilla, a native of Cambrai in Northern France, who was born there in 1548.

THE PALM HOUSE

The large structure of glass and iron, known as the Palm House, is situated close to the Victoria Gate and will be noticed at once on entering. It was erected in 1844–48 to the designs of Mr. Decimus Burton who was also the designer of the wrought iron Main Gate. This structure, which for long was the largest glass house in existence, is just over 120 yards long and consists of two wings and a transept. The latter is 100 feet wide and 66 feet high, while each wing is 50 feet wide and 30 feet high.

The Palm House is connected by an underground tunnel with the Campanile or Water Tower which will be seen next to the Victoria Gate. This tower was erected at the same time as the Palm House and was intended as a smoke shaft for the furnaces underneath the Palm House; the tunnel was to be the connecting flue. A reservoir was also constructed at the top of the tower so that the palms could be watered overhead. The Campanile is not now used for either purpose and the smoke is carried away by two chimneys, one in each wing. The tunnel serves as a means of access for the supplies of coke used to heat the furnaces.

On account of the dangerous state of its structure it was closed for repair in 1952, and reopened on 2nd June, 1959.

THE QUEEN'S BEASTS

The bonds connecting the Royal Botanic Gardens and the Royal Family were further strengthened in 1956 by the gift to the Gardens of the statues of the heraldic figures known as the Queen's Beasts. These statues are replicas in Portland stone of the ten royal creatures which stood in front of the great window of the Abbey Annexe during the coronation ceremony of Her Majesty Queen Elizabeth the Second in 1953, and are from the hand of the same sculptor, Mr. James Woodford, O.B.E., R.A. The donor of the statues wishes to remain anonymous.

The statues are the ten finally selected from the many heraldic beasts which figure on the armorial bearings of Her Majesty's forbears and are judged to be those best fitted to illustrate Her Royal descent.

They have been erected, each with its shield, at the foot of the Palm House Terrace facing the pond and are in order from right to left:

1. *The White Greyhound of Richmond.* This beast was the badge of John of Gaunt, Earl of Richmond, son of Edward III, but it was also used by Henry IV and perhaps more so by Henry VII. On the shield can be seen the Tudor double rose, one rose within another and both surmounted by a crown. The device symbolises the union of the Houses of York and Lancaster.

2. *The Yale of Beaufort.* The Yale descends to the Queen from Henry VII who inherited it from his mother Lady Margaret Beaufort. The Yale is a purely mythical beast whose peculiar characteristic was the ability to swivel each horn independent of the other. In colour it was white covered with round gold spots. The shield portrays a portcullis surmounted by the arched royal crown. The portcullis (uncrowned) was a Beaufort badge but was also used by Henry VII both crowned and uncrowned.

3. *The Red Dragon of Wales.* The red dragon which is now one of the Queen's Beasts is Welsh in origin. Owen Tudor, the grandfather of Henry VII, took a dragon as his device, and the latter used it in token of his descent from Cadwalader, last of the line of Maelgwn, King of Wales. The dragon supports a shield with four quarters in each of which is a red leopard. This was the coat of Llewelyn ap Griffith, the last native prince of Wales.

4. *The White Horse of Hanover.* On the death of Queen Anne in 1714 the crown of Great Britain passed to George, Elector of Hanover, who was a grandson of Elizabeth, sister of Charles I. The Elector of Hanover thus became George I, King of Britain, France and Ireland, and in addition Duke of Brunswick-Lüneburg. A white horse had been part of the armorial ensigns of the House of Brunswick from early times and our statue representing the beast bears a shield which portrays the titles of the Elector after he became George I. On the shield the quarters representing the kingdoms of Ireland (Harp) and France (Fleur de Lys) are readily made out. In the first quarter are the leopards of England and the lion of Scotland side by side. In the fourth place are the arms of Hanover.

5. *The Lion of England.* Three golden lions set one above the other on a red field have appeared in the coat of arms of every sovereign of this country since the king of beasts was chosen as a royal device by Richard Lion-heart, son of Henry II (1133–89). The

supporters of the royal arms were fixed after the accession of James I (1603), namely a crowned golden lion of England on the one side and the Scottish unicorn on the other. The crowned lion holds a shield with the Royal Arms as they have been borne since the accession of Queen Victoria in 1837.

6. *The White Lion of Mortimer*. This beast descends to the Queen through Edward IV who inherited it from his grandmother Anne Mortimer, the heiress of the Mortimers, Earls of March. Unlike the Lion of England, this beast is uncrowned. The badge upon the shield is really a combination of two—a white rose and a golden sun. Both of these appear on the great seals of Edward IV and Richard III, and were used by George VI when Duke of York.

7. *The Unicorn of Scotland*. On the death of Elizabeth I in 1603 the crown of England passed to James VI of Scotland. King James took as the supporters of his arms a crowned lion of England and a Scottish unicorn. A unicorn was certainly a royal beast at the time of James I (1406–37) and in the latter part of the 16th century two unicorns were adopted as the regular supporters of the Scottish Royal Arms, which are to be seen on the shield held by the unicorn.

8. *The Griffin of Edward III*. The griffin is one of the most ancient of mythical beasts and despite his formidable appearance was regarded as a beneficent creature. The griffin was closely associated with Edward III and was engraved on his private seal. The griffin supports a shield upon which is the Round Tower of Windsor Castle, the badge of the present House of Windsor.

9. *The Black Bull of Clarence*. This beast together with the White Lion of Mortimer have both descended to the Queen through Edward IV. Lionel, Duke of Clarence, whose badge was a black bull, was the third son of Edward III. He married Elizabeth de Burgh, heiress of the Earls of Ulster, and his grandson became Edward IV. The shield is charged with the Royal Arms as they were borne from 1405 to 1603, not only by Edward IV and Richard III, but also by all the Sovereigns of the House of Lancaster and Tudor.

10. *The Falcon of the Plantagenets*. Apparently the first English monarch to use the falcon as a badge was Edward III, and it was also adopted by his sons the Black Prince, John of Gaunt and the Duke of York. Through the latter it descended to Edward IV, who took it as his personal badge, seated within an open fetterlock, as may be seen upon the shield supported by the falcon. The significance of the slightly opened padlock is assumed to refer to the struggle Edward IV had to ascend the throne of England—he forced the lock and won the throne.

THE DUTCH HOUSE

(*Kew Palace*)

The red brick building near the northern end of Broad Walk (see page 119) is called 'Dutch House' or 'Kew Palace'. This house, built in Dutch style, was erected in 1631 upon the foundations of an old dwelling called 'Dairy House', which belonged to Sir Henry Gate in 1552–53. The Dairy House was afterwards owned by Dudley, Earl of Leicester, favourite of Queen Elizabeth. The Dairy House was pulled down and the only remnant of it which remains is a Gothic crypt, with a vaulted roof, beneath the present building which was built by Samuel Fortrey in 1631. The initials of his wife and himself are cut above the doorway with the date of erection—('F.S.C.' stands for Fortrey, Samuel and Catherine). George III acquired this building in 1781 from the descendants of Sir Richard Levett who had himself purchased it in 1700. The building was used regularly as a residence by George III and his family after 1802. The Dukes of Clarence and Kent were married here in July 1818, and in November of the same year Queen Charlotte died in one of the rooms on the first floor. The house was shut up soon afterwards and remained closed till 1899. Since then it has been open to the public during the summer months.

The rooms contain many fine specimens of period furniture as well as numerous historical documents, paintings and watercolours.

THE TEMPERATE HOUSE

The Temperate House, one of the largest glass houses in existence, lies almost due west of the North Gallery and south-west of the Flagstaff. It was designed, like the Palm House, by Decimus Burton. He did not live to see the completion of the building, which although started in 1860, was not finally completed till 1899. It consists of a large central hall and two wings connected to it by octagonal-shaped smaller houses and is 604 feet long.

NORTH GALLERY

Midway between the Flagstaff and the Ruined Arch, by the eastern wall of the Gardens, is to be found a building called the North Gallery.

This building houses a collection of flower paintings which are the life work of that remarkable Victorian, Miss Marianne North. In all there are 848 paintings, completed in the comparatively short period of 13 years (1872–85), for the execution of which Miss North visited many parts of the earth in order to portray the plants and their flowers in their natural setting.

The Gallery and the paintings were presented as a gift to the Gardens by the artist herself, but it is a pity that the unique results of such industry and artistic talent should have been crowded on walls which are only sufficiently large for the display of a tithe of the paintings.

Theobroma cacao
Cocoa in Fruit

Rhododendron Dell, June

Special Areas

THE RHODODENDRON DELL AND BAMBOO GARDEN

THIS winding valley, devoted almost exclusively to the cultivation of Rhododendrons, was excavated by a company of Staffordshire Militia in 1773 on the instructions of an energetic individual called 'Capability' Brown, landscape architect to George III. The path which crosses the dell at its northern end is still known as Stafford Walk.

Under the shade of some magnificent cedars of Lebanon, one of the largest plane trees in Britain, ancient Weymouth pines and some beeches of immense size, are collected together one of the finest assemblages of Rhododendron hybrids to be found in this country.

Sir William Hooker began to plant the dell with Rhododendrons about a century ago and ever since it has been devoted to the larger and hardier members of the genus.

The dell—it is really a miniature valley—is at its best from mid-May to the first weeks of June, during which period the blaze of colour baffles any attempt to convey its glory in words and which, as a whole, is best viewed from the southern end. In January, however, *Rhododendron nobleanum* begins the sequence with its trusses of rose-coloured flowers and is followed by other species as long as the weather is favourable (for more than five degrees of frost will destroy expanded Rhododendron flowers).

One of the most beautiful of the genus is *R. cinnabarinum* because, unlike so many members of the genus, the flowers are beautifully shaped and not too crowded in the truss. Another striking species, also from the Himalaya, is *R. arboreum*, which grows to a height of 30 feet with trusses of scarlet flowers.

When Rhododendrons were first planted at Kew, there were only about 20 species known to be hardy, which had been introduced into this country from various parts of the world. Sir Joseph Dalton Hooker, the son of the first Director of the Royal Gardens, travelled in the Himalaya about the middle of the last century, and it is to him and his introductions that we owe our enthusiasm for these plants which has increased rather than diminished with the large number of new species discovered in the last hundred years.

When the number of species was small the flowering season was rather short, from May to June. This is still the peak period of blooming, but it has been greatly extended by the numerous new species and hybrids. These come mainly from Western China and Tibet, where they were collected and introduced by such well known travellers as E. H. Wilson, G. Forrest, F. Kingdon-Ward, J. F. Rock, R. Farrer and others. It is now possible to have rhododendrons in flower for seven to eight months of the year.

Only a small number of the wild species can be cultivated at Kew, because late spring frosts often damage the young shoots, and droughts are detrimental to their growth. Rhododendrons are surface-rooting plants and prefer a cool moist climate. These conditions are best fulfilled in Cornwall and Devon where Rhododendrons grow even better than they do in their native habitats. Apart from their lovely flowers, many of the species and hybrids are well worth growing for their leaves alone. *R. ponticum* has become naturalised and can be seen wild in many parts of the country.

True Rhododendrons have usually evergreen leaves and ten stamens. Most Azaleas have deciduous leaves and five stamens. Since, however, some evergreen Rhododendrons have only five stamens whilst some Azaleas have up to ten stamens, botanists have agreed to their amalgamation under the one genus *Rhododendron*, but the term Azalea is convenient to designate the deciduous types.

True Rhododendrons are classified into numerous smaller groups called series, each series being named after the best known or more distinct species. For example, *Rhododendron arboreum* is the typical species of the Arboreum series, and there are fine examples of it to be found in the Himalayan House, with numerous hybrids derived from it in the Rhododendron Dell, where many other fine types may be seen in all their glory in May and June. Some of the series are characterised by their leaves being clothed on the lower surface with mushroom-shaped scales (modified hairs). These are known as *Lepidote* Rhododendrons, and they range in habit from fair-sized forest trees to tiny shrublets which grow like heather at high elevations and some of these can be seen in the Rock Garden. The leaves of other species are covered with a dense coat of hairs (*Lanatae*) whilst a great number, such as those of *R. ponticum*, are smooth (*Glabratae*). One or two of the hairy-leaved species have foliage up to three feet long.

Most of the more hardy dwarf species will be found around the King William's Temple mound, and the more tender are grown in the Himalayan section of the Temperate House and the special Rhododendron House in the same range.

To the east of the dell and opening out of it is the Bamboo Garden, which was excavated in 1891. In this garden are collected the majority of the hardy bamboos grown at Kew, comprising plants which come mainly from China, Japan and the Himalaya.

Bamboos are grasses but they differ from the more familiar grasses in several ways. In the first place they are woody and the largest of them are comparable to trees—that is, their stems may reach a height of over 100 feet and 1 foot in diameter. Secondly most of them do not flower every year, but flower periodically. This periodicity of flowering varies within wide limits. A few flower every year, but others, especially the Asiatic bamboos, have a more prolonged life cycle. The cycle varies with the species and some species about which sufficient information is available show that the successive flowerings are approximately equally spaced. Thirdly, in those species which have a periodic flowering, the flowering is followed by the death of the clump.

In countries in which bamboos are common, it is found that the gregarious flowering of the bamboos is followed by a plague of rats and mice. The reason for this is the enormous quantities of seed produced by the bamboos which leads to a prolific increase in the numbers of rats which feed upon it. When the bamboo seed is all devoured, these rodents turn their attention to the neighbouring crops. While the flowering of the bamboo means a time of plenty for all concerned as long as the seed lasts, the two or three years following often mean something like famine to those with fields close by bamboos which have flowered.

Interspersed among the bamboos are species of *Yucca* and several species of *Hosta* (*Funkia*), monocotyledonous plants with attractive flowers. Another decorative grass, *Miscanthus*, is grown here, and the beds are bordered with *Ruscus*, an interesting genus in which the so-called leaves are really flattened branches—the true leaves are the small green scales on the mid-ribs of the false leaves.

In SUMMER a touch of colour is given to the bamboo garden by the numerous foxgloves which are planted in the beds.

THE CHALK GARDEN

The Chalk Garden occupies the site of the old ice-house. There are many plants which only thrive on a chalky soil rich in calcium and the soil of Kew is a river sand naturally poor in this element. The Chalk Garden was constructed in 1944 to meet the needs of the lime-loving species. On the right-hand side are grown native plants and on the left-hand side foreign species which prefer this type of soil. It will be noted that many of these are rosette plants or species with a mat-like habit that are low in growth except when in flower. Amongst these mat plants are the yellow-flowered Horseshoe-vetch (*Hippocrepis*), the purple Milk Vetch (*Astragalus danicus*) and the blue chalk milk-wort (*Polygala calcarea*) all conspicuous in spring. Rosette plants are represented in spring by the Pasque flower (*Pulsatilla*) and in summer by the Wild Sainfoin (*Onobrychis viciifolia*). The beautiful Rampion with deep blue heads (*Phyteuma tenerum*), the spotted Cat's Ear (*Hypochoeris maculata*), with golden marigold-like flower heads and the Dropwort (*Filipendula vulgaris*) with flowers that are creamy-white. In the background can be seen some of the more characteristic chalk shrubs such as Mezereum (*Daphne mezereum*), Wayfaring Tree (*Viburnum lantana*), and Spindle (*Euonymus*), whilst in the foreground some of the chalk annuals such as Pheasant's Eye (*Adonis annua*), Gromwell (*Lithospermum arvense*) and Ground Pine (*Ajuga chamaepitys*) commonly occur. Here also are grown the British strains of two of the central European species that are found as rare species wild in Breckland, namely, *Artemisia campestris* and the Catchfly (*Silene otites*).

THE HERBACEOUS GARDEN

In the north-eastern corner of the Gardens to the right as one enters the Cumberland Gate, are beds containing a collection of herbaceous plants. On both sides of the opening there is a thick growth of the pink-flowered *Bergenia ligulata*, a native of the Himalaya. The area is bounded on the east by a wall separating it from Kew Road, on the west by one of the old walls of Kew, on the north by part of the west wall and by the Jodrell Laboratory, and on the south by an embankment separating it from the path leading to the Cumberland Gate. On this bank are grown a number of flowering cherries and *Laburnum*.

The garden is laid out in a series of parallel beds. The area allotted to each family corresponds roughly to the number of species it contains. Thus the Dandelion and Thistle family, which comprises more than 13,000 species, is represented by a selection occupying 29 beds, whilst smaller families often share a bed. The number of species cultivated in this garden varies, but there are normally some 6,000 different kinds grown here. Since a very large proportion of these are annuals and most are exotics, their culture not only demands constant care, but is in part dependent on the production of fertile seed.

Entering the garden from the south it will be seen that a rose pergola divides the garden into two halves. Behind the wall to the north of the left half is Museum II, and the southern wall of this Museum supports one of the finest specimens of the climber, *Wistaria sinensis*, in the country. It covers the whole of the southern face of the building and is a magnificent sight in May.

The first bed on the left before crossing the path is planted with several species of yam (*Dioscorea spp.*) relatives of our Black Bryony.

Crossing over, the first beds on the left are occupied by the Buttercup family (*Ranunculaceae*), and in these beds will be seen familiar plants such as *Anemone*, *Delphinium*, Paeonies, *Clematis*, Hellebore, and Columbine. The Poppies (*Papaveraceae*) come next, and then the Crucifers (*Cruciferae*) to which a number of our common vegetables such as Cabbage, Cauliflower and Mustard belong. The Woad (*Isatis tinctoria*) will be found here, a reminder that not so long ago our forefathers used it to dye their bodies blue. Then come the Pink family and the Rose family, comprising such well-known plants as Strawberries, Spiraeas, and the like, then a series of beds containing the Sweet Pea family to the Teasel family (*Dipsaceae*).

Returning to the southern entrance the sequence is continued on the right with the carrot family (*Umbelliferae*), a family to which other vegetables, Celery, Parsley and Parsnips, belong. Next comes the Sunflower and Aster family (*Compositae*). This being perhaps the largest family in the world, it is right and fitting that a number of beds should be devoted to it. The flowers of the *Compositae* are collected into heads surrounded by a number of green bracts, an arrangement which gives the appearance of a single flower to what in actuality is a group of flowers that individually are small and sometimes, as in the Thistlehead or Dandelion, very numerous. The family includes the Michaelmas daisies, asters, golden rods, sunflowers, artichokes, and many more. It is this family more than any other which gives to the garden its autumn display of colour. Passing on, one comes to the Gentian family, the Borage family and the

Potato family (*Solanaceae*) to which last the Tomatoes and Tobacco also belong. The Sage family (*Labiatae*) is well represented and includes a great number of our pot herbs such as Mint, Thyme, Sage and Marjoram. A short distance ahead is found the Rhubarb family and the Goosefoot family, among which in addition to the weeds of cultivation, will be found the Spinach. The series of dicotyledonous plants ends with representatives of the Spurge family or Euphorbias and the Nettle family, some members of which yield important fibres. Examination of the beds nearest the middle path will often give one a very good idea of the wide range of habit within a family, although the structure of the individual flowers is often remarkably similar.

The long line of beds is continued across the path by beds which contain the monocotyledonous families, Rushes, Sedges and Grasses.

Along the east wall will be found a large collection of species and varieties of Ivy, sheltered from the western sun by a row of Horse Chestnuts.

In SUMMER and AUTUMN will be seen a number of ornamental gourds trained upon vertical poles on the west side of the beds.

The bed along the foot of the west wall is occupied with plants belonging to the Lily and Narcissus families (*Liliaceae* and *Amaryllidaceae*). Here will be found species of *Asphodelus*, *Allium* (Onion), Fritillarias, *Colchicum* and others. Attention may especially be drawn to the tall handsome *Allium schoenoprasum* var. *sibiricum*, over four feet high, and at the other extreme, the small blue-flowered *Allium coeruleum*. Against the wall are trained a number of interesting climbing and shrubby plants, among which species of *Clematis*, *Cydonia*, *Indigofera*, and *Pyracantha* grow particularly well.

Another interesting species is *Mahonia trifoliolata*, a rare shrub which is at home in the rocky hills of New Mexico, Texas, and Mexico. It is quite different from all the other species of *Mahonia* in only having three spearhead-like leaflets which are often very pale or almost white. The Pomegranate, *Punica granatum*, does well against this wall and produces its showy scarlet flowers from June onwards. The large leathery fruits, filled with a very juicy pulp, are rarely produced in this country, though in 1949 the long hot summer was followed by reports of fruits having been developed in many parts of the south.

North of the opening in the wall, halfway along, is the bed of species of *Amaryllidaceae* to which the beautiful garden genera *Alstroemeria* and *Narcissus* belong, and which are represented by many species. Along the foot of the North Wall is the bed containing species of Tulip, *Gladiolus*, *Agapanthus*, *Iris*, and several choice species of Paeonies. The wall supports a number of unusual and handsome shrubby climbers of which noteworthy examples are the following. The Fuschia Gooseberry, *Ribes speciosum*, which produces pendulous clusters of rich red flowers in early summer—the bristly red fruits are rarely seen in this country. The Wild Irishman, *Discaria toumatou*, a deciduous shrub whose home is New Zealand, grows well here. It is remarkable for the very large, sharp-pointed spines which are as thick at the base as the branch from which they spring. *Anthyllis hermanniae*, a deciduous shrub, native to the Mediterranean, is a relative of our own English kidney vetch. *Akebia trifoliata*, a climbing shrub belonging to the *Lardizabalaceae* and native to China and Japan, produces racemes of purple flowers in April. The male flowers are smaller than the female, but are found on the same raceme, the latter being basal. The fruits are striking, being sausage-shaped and pale violet in colour; when ripe they split from the base showing rows of black seeds embedded in a white pulp.

THE MOUND GARDEN

To the north of Museum I is a mound, surmounted by a building called the Temple of Aeolus, erected by Sir William Chambers in 1761. The grass over the greater part of the mound is treated as a meadow with wild flowers. There are several large elms, horse chestnuts, sweet chestnuts, and a black walnut on the mound, and in their shade thousands of bulbs of snowdrops, crocuses and daffodils have been planted. In SPRING, when these bulbs flower, the mound can be very beautiful. On the sides of the mound bordering the Museum, and towards the east, several beautiful flowering trees have been planted. Among them will be found *Magnolia denudata*, with beautifully shaped white flowers, and several of the better flowering cherries. The beautiful *Prunus yedoensis* grows between the mound and the Museum. To the west, *Laburnum* is the principal flowering tree.

To the north and west is a large bed which is planted with beautiful flowering shrubs, mostly Rhododendron, interspersed with species of *Hosta* (*Funkia*), *Lilium* and *Meconopsis*. The beds on the slope are planted with species of *Epimedium* and many lily hybrids.

CAMBRIDGE COTTAGE GARDEN

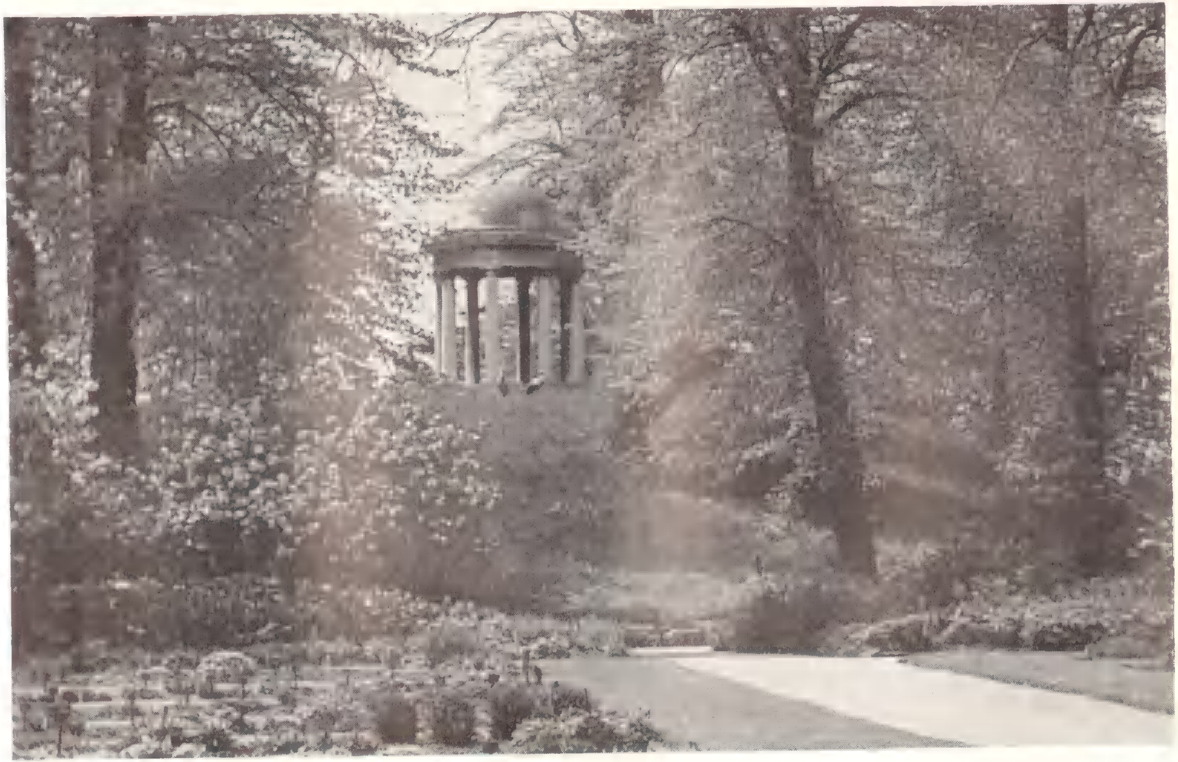
This most attractive walled garden, as its name implies, was originally the garden of Cambridge Cottage (see page 118) once the residence of the Duke of Cambridge and of which part is now Museum III (see page 118). It is kept as far as possible as an old-fashioned flower garden for preserving some of the older varieties of flowering plants which in most gardens have been replaced by more modern though not always better types.

The large bed under the shade of the south wall is devoted to a collection of Lilacs, underplanted with species of hellebore, and on the east side is a large bed planted with a variety of the smaller rhododendrons and several flowering cherries, in the partial shade of which is grown a collection of lilies. The east wall supports a superb scarlet *Camellia* 'Kimberley', and various species of *Clematis* and *Schizandra*. Skirting the western wall is a broad bed in which blue-flowered plants predominate. Against the wall itself are grown blue-flowered *Clematis* and *Ceanothus*, and a fine bush of Winter Sweet (*Chimonanthus praecox*). On the lawn may also be seen several species of Crab Apple, Magnolia, and a Liquidambar tree.

In the north-east corner, by the side of the Museum, is a formal arrangement of beds devoted chiefly to a collection of medicinal plants. Here will be found the Deadly Nightshade (*Atropa belladonna*), Woad (*Isatis tinctoria*), the source of the blue dye used by the ancient Britons, and other interesting herbs. In the centre of this physic garden is an ingenious gun-metal sundial of 36 faces in the form of a Greek cross, which was designed, executed and presented by the late Professor C. V. Boys, F.R.S., in 1929, which has been erected upon one of the pilasters of Old Kew Bridge, presented to the Gardens by Mr. George Hubbard. By the use of the tables provided, this sundial is accurate to within a minute. Around its foot a turf of Chamomile is maintained with difficulty against the invasion of grass. Chamomile lawns were greatly prized in Tudor times.

QUEEN'S COTTAGE AND GROUNDS

In the south-western corner of the Gardens is a railed-off area of 37 acres of woodland, traversed by a single cindered path. This area constitutes the grounds of Queen's Cottage the whole of which was handed over to the nation in 1897 by Queen Victoria, in commemoration of her Diamond Jubilee. When making the gift of these grounds, Her Majesty expressed the desire that they should remain in their semi-wild condition. This wish has been respected and apart from



Temple of Aeolus on the Mound

the clearing of certain vistas through the woods, the planting has been carried out so as to maintain the natural appearance.

The trees—oak, ash, elm, beech, birch, willow, and some conifers, grow closely together, while underneath there is a thick growth of bramble. The open vistas are mown over once a year for hay, and in the spring they are carpeted with lovely masses of bluebells, of such beauty that the grounds have become almost a place of pilgrimage. These woods, of unrivalled charm and beauty, constitute an ideal sanctuary for wild birds. The number of species of birds which have been recorded in the Gardens is not far short of one hundred, and the majority of the species nest in this area.

Close to the southern boundary and near the cindered path where it enters the grounds from the east, stands the romantic old house known as the Queen's Cottage. This old building, said to have been erected by George III in 1760, shortly after the death of his father, was used in Queen Victoria's time as a summer house for picnics and as a shooting box.

Romantically minded engaged couples have no doubt cast longing eyes upon the cottage, roofed with a thick covering of thatch and embowered in ivy, which 'represents exactly the type of rural cottage one sees pictured on the stage and in pastoral poems, but seldom in real life'.* Alas for its utility—the cottage has no water, light or sanitary fittings, and while it has no fewer than four entrances, there are only two rooms—one above and one below, with two small kitchens. The upper room is reached by two staircases, one at each side, and the only way from the north kitchen to the lower room, without going outside, is up one staircase, through the upper room and down the other—a more uncomfortable habitation it would be hard to find.

THE ROCK GARDEN

The Rock Garden was initiated during the regime of Sir Joseph Hooker, in 1882, but has been reconstructed and extended more than once. It takes the form of a sunken garden constructed of stone, with a stream running through it. The principal material employed was limestone from the Mendips, and weathered boulders from the Craven Moors in Yorkshire, but there is a large section at the north end, constructed of Sussex Sandstone, forming an island almost surrounded by the stream. On the eastern side of the island the stone is Oolite from Moreton-in-the-Marsh, Gloucestershire. In the middle section to the west a bog garden has been constructed.

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*W. J. Bean. *The Royal Botanic Gardens*, Kew.

Recently portions of the eastern and western sides have been rebuilt, using Sussex Sandstone. This material has been found to be more satisfactory than some of the other rocks, since it does not get so hot in the summer and holds water better.

The plants cultivated here are such as will tolerate our climate and include many from mountains of the temperate regions, as well as from high altitudes in sub-tropical regions, such as the Himalaya and the mountains of China. The habitats from which some such plants come are very cold in winter, often hot and dry in summer, occasionally buried in snow for a considerable portion of the year, so that the growing season is usually short. A striking feature is the wide geographical range of the species grown here, showing that under cultivation and with the minimum of competition which cultivation can ensure, many species can survive in climatic conditions that in a wild state these plants could not endure.

The Alpine Saxifrages, Ramondias and Androsaces furnish examples of rosette plants; succulent alpines are represented by many species of *Sempervivum* and *Sedum*; carpet and mossy habits are exhibited by several Saxifrages, the Acaenas from New Zealand, and the small southern-hemisphere Gunneras.

A fine collection of *Meconopsis*, the Himalayan Blue Poppy, is to be seen at the southern end of the garden, where also one of the few yellow flowered members of the genus, *M. paniculata*, is to be found. It is interesting to note that our own flora possesses a yellow *Meconopsis, M. cambrica*, whose nearest relatives are in the Himalaya—an interesting example of discontinuous distribution.

Here, too, are a number of the Himalayan Primulas, though some of these do better in the boggy part of the garden near the stream. In this part are also to be seen the Soldanellas, *Astilbe*, the North American Slipper Orchids, Himalayan Irises, and the Rodgersias. The number of gentians grown is considerable and add a vivid touch of colour in SPRING together with the early bulbous plants such as the *Narcissi*, Roscoeas, Muscaris, also *Adonis*, the Hellebores, and the early dwarf Rhododendrons which come mainly from the high Himalaya and Yunnan.

The Rock Garden is probably at its best in early SUMMER, but flowering of Campanulas and other genera is prolonged well into the AUTUMN.

THE BERBERIS DELL

This pretty hollow known as the Berberis Dell lies due south of the Temple of Bellona near the Flagstaff. It was excavated in the fifties and sixties of last century and is now devoted to the cultivation of the Barberries. The genus *Berberis* is a very large one and comprises both evergreen and deciduous species which are found in Europe, the Himalaya, China and Japan, North America and Chile. The closely allied Mahonias are now usually placed in a distinct genus differing from *Berberis* in having spineless branches and pinnate leaves, whereas *Berberis* has simple leaves and the branches are always armed with spines.

The flowers of all the species of *Berberis* are yellow, but the fruits are various shades of red and purple. The wood of the Barberries is yellow and the old belief in the doctrine of signs led to the use of a decoction of the British Barberry *B. vulgaris* as a remedy for jaundice. This shrub is the host in one phase of the life cycle of the black rust of wheat. One of the most colourful of this genus is the popular hybrid *B.* × *stenophylla* of which the putative parents are the evergreen *B. darwinii* and *B. empetrifolia*, both of them natives of Chile, which have been in cultivation ever since the beginning of the 19th century. There is a large mass of this in the Dell and in SPRING it is covered from end to end with rich golden-yellow flowers.

THE LAKE

The lake, which covers an area of about four and a half acres, is one of the most attractive features of Kew. It is entirely artificial and was first excavated about 1845, and was enlarged several times afterwards. The material removed was utilised to make the 15 or 16 miles of paths through the Gardens, to raise the level of the area to the south of the lake itself, and to form the raised terrace upon which the Temperate House was constructed. The lake is connected by an underground culvert with the Thames, a hundred yards away, and the river is the sole source of supply of water. The surface of the water is raised when necessary, at high tide, usually at full and new moon. The lake contains several islands upon which can be seen specimens of the Deciduous Cypress, *Taxodium distichum*, a native of America where it is commonly found in the swamps bordering the Mississippi River. The banks of the lake are planted with willows, poplars, alders and moisture loving plants. Among the latter will be found Meadowsweet (*Filipendula ulmaria*), Purple-flowered Loosestrife (*Lythrum salicaria*), Yellow-flowered Loosestrife (*Lysimachia vulgaris*), Reed Mace (*Typha* spp.), Sweet Flag (*Acorus calamus*) and many others. Out in the deeper water white and red water-lilies are planted. At the eastern end of the lake a large group of the small purple Siberian Iris (*Iris sibirica*) is planted, and this is an object of great beauty in SUMMER. Merlins Cave was erected by Queen Caroline about 1730 on a site which was close to the south-west corner of the lake—no trace of it now remains. The ornamental waterfowl which breed upon the islands are a very popular feature with visitors, and the more confiding birds derive a considerable portion of their food from this source.

THE AQUATIC GARDEN

The Aquatic Garden is situated on the eastern side of the Iris Garden, just north of Museum II, and is in the form of a rectangle surrounded by a hedge of *Berberis × stenophylla*, a hybrid which produces masses of golden-yellow flowers in SPRING.

The Aquatic Garden comprises a central large tank containing a collection of red, white and yellow water lilies, and this is flanked by beds of marsh plants, whilst the corners of the rectangle are occupied by four more or less triangular tanks containing a selection of British water plants. These include the beautiful Flowering Rush (*Butomus*) and Bogbean (*Menyanthes*), the large handsome Water Dock (*Rumex hydrolapathum*), the Bulrush (*Scirpus lacustris*) and the Star Fruit (*Damasonium stellatum*), the last-named a species once much less rare in England than it is today. In the side beds the marsh plants include two other species which have greatly diminished as British wild plants, namely the tall and handsome Marsh Sowthistle (*Sonchus palustris*) and the Marsh Fleabane (*Pulicaria vulgaris*).

THE POND

Situated between the Palm House and Museum I, this is a small piece of water fed by a spring. Originally it was part of a shallow backwater of the Thames and the present sheet of water was constructed in 1847 by Nesfield, a professional landscape gardener employed for the purpose by Sir William Hooker, who after several previous attempts to make something of it had it shut off from its parent river. The south-western end and part of the two adjoining sides of the pond are faced with brick and over them trail festoons of rambler roses which add much to the attractions of the pond in SUMMER. The eastern end slopes down to the water and the marshy soil is planted with the beautiful Siberian Iris and sedges of various kinds. A large *Senecio*, *S. clivorum*, is also to be found here as well as the great Rhubarb-like *Gunnera manicata* from Chile which bears

Museum I (first opened in 1858) and the Pond its large leaves in SUMMER. A small island close to the western side of the pond supports a growth of small bamboos and is frequented by the ornamental waterfowl. On the banks of the pond will be seen several specimens of the deciduous Swamp Cypress, *Taxodium distichum*, a conifer at home in the swamps of the Mississippi River in America. The South European Alder, *Alnus cordata*, is also there as well as several willows and poplars. Two trees of some interest should not be missed. The Weeping Willow, *Salix babylonica*, was raised from a cutting of this species growing over Napoleon's grave in St. Helena. The oak, *Quercus petraea* (*Q. sessiliflora*), near the steps, on the eastern side, sprang from an acorn picked up on the battlefield of Verdun, a battlefield rendered immortal by the heroism of the French Army in 1916. The steps are flanked by a pair of magnificent guardian lions presented to the Gardens in 1958 by the late Sir John Ramsden. These superb sculptures are reminiscent of those in the Imperial Palace at Peking. It is believed they were carved in the 18th century, but an earlier date in the Ming period (1368–1644) cannot be altogether ruled out.

THE LILY POND

This depression occupies the site of an old gravel pit which was applied to its present use in 1897. A collection of hybrid lilies is grown in the pond and gives a fine display in SUMMER. It should be remembered that these plants are at their best in the mornings when the flowers are fully expanded. In addition to the horticultural varieties of the White Water Lily, some of the tropical white and red species are also planted annually, and these bear their flowers well above the surface of the water. Growing in the pond is to be seen a fine specimen of the Swamp Cypress, *Taxodium distichum*. A seedling *Metasequoia* was planted on the bank in 1949.

Glass Houses

THE AROID HOUSE

(*House No.* 1)

THE Aroid House, situated close to the Main Gate, is devoted to the closely related Arum (*Araceae*), Ginger (*Zingiberaceae*) and Arrowroot (*Marantaceae*) families, as well as *Cyclanthaceae*—plants from which Panama hats are made—Pepper (*Piper* spp.), and other species from humid tropical forests. The Aroids are represented in the flora of these Islands by the 'Cuckoopint' or 'Lords and Ladies', but the family is mainly tropical and is composed of herbaceous plants with a characteristic inflorescence. This consists of a hood (the 'spathe'), which may be white or brightly coloured, and associated with it a rod-like spadix on which the minute male and female flowers are arranged.

The House itself, originally erected at Buckingham Palace, was brought piecemeal from there in 1836, and re-erected in its present position at Kew. It is by far the oldest plant house in the Gardens.

The temperature in the House is maintained at about 80°F., and the humidity of the air is kept at a high figure. In such conditions a vegetation can develop which is characteristic of the undergrowth in evergreen forests of the tropical regions.

The visitor will be impressed by the climbing species (*Philodendron*, a tropical American genus) that ascend the walls and wind up the pillars, which provide the support furnished by trees under natural conditions. Some of the species have entire rather leathery leaves, those of *Pothos* being pressed flat against the surface upon which the plant climbs, while those of *Monstera* are cut and dissected and even perforated in a most interesting fashion.

The genus which is best represented in this House is *Anthurium*, many members of which come from South America. In this group the 'spathe' is flattened and very often of a most gorgeous glossy crimson colour. The leaves, too, are very attractive, being sometimes almost velvety in texture and variegated. One of the species, *Anthurium pendulifolium*, with large drooping leaves is grown in wire baskets suspended from the roof.

Other interesting plants in this House are *Alpinia bracteata*, one of the Gingers, an Indian aromatic plant much beloved by elephants; *Clinogyne dichotoma*, from the stems of which the far-famed mats of Eastern Bengal are woven, mats so smooth that a snake is said to be unable to get off if laid upon one; *Alocasia macrorrhiza* from the fleshy stems of which a kind of sago is obtained; *Colocasia esculenta* is another valuable species with very large leaves and fleshy underground stems. These latter contain much starch and are widely used for food, especially in India and Burma. During the recent war the potato ration for the troops in Assam and Burma was occasionally replaced by the rhizomes of this species. Several herbaceous species of the tropical American genus *Dorstenia* may be seen on the staging. The flowers in this genus, which is allied to the figs and mulberries, are arranged on a fleshy concave receptacle. The fig one eats is another such inflorescence with a hollowed receptacle lined with the flowers, the so-called fig-seeds.

Baikiaea insignis, a leguminous tree from West Tropical Africa, to be found in the central beds towards the south, is remarkable for its very large white flowers, which open about 5 o'clock in the evening during August.

FERNS, CLUBMOSSES, ETC.

Much of the special interest which botanists have in ferns and other non-flowering plants centres round the fact that they formed an important feature of the earth's vegetation in remote geological times. Among the earliest land plants of which we have evidence, are those found in the Devonian series, laid down some 300 million years ago. Since that period Ferns, Clubmosses, and their allies have constituted a significant feature of the vegetation of the earth's surface. Today over 4,000 species of Ferns are known.

The life history of a Fern demonstrates with exceptional clarity what is called the alteration of generations in plants, namely a sexless generation reproducing by spores alternating with a sexual generation reproducing by the fusion of a sperm or male cell with an egg or female cell, a scheme which can be traced in all higher plants.

One of these generations, the sporophyte, is the Fern plant itself; the other is a very small often scale-like body, very delicate in texture, which is called the *prothallus*. This structure which usually escapes observation though it is common enough (a small exhibition of prothalli is staged in the Cool Fern House), bears the male and female organs.

The life history of a Fern is as follows. A Fern spore germinates on moist soil and grows into the prothallus, which bears sexual organs on the undersurface. The prothallus must be covered with a film of water if fertilisation is to take place, a feature which suggests its amphibious origin, since the male cells, when released, actively swim towards the egg cell. The result of this fusion is the starting point for the development of a new Fern plant.

When full-grown, the Fern produces its millions of spores in many small, often stalked, cases which commonly occur in small patches on the undersurface of the frond. The position of these collections of spore cases, whether covered or not, whether on special fronds or on the ordinary leafy one, and the structure of the spore cases themselves are the criteria upon which the classification of Ferns is based.

THE FERN HOUSES

(*Houses Nos.* 2 & 3)

In the Tropical Fern House (No. 2), which is maintained at a temperature of 80°F. with high humidity, a habitat has been created in which the tropical ferns flourish. Many species are grown in pots, others are planted in the beds, whilst the epiphytes are provided with supports upon which they live in a manner comparable to that in their homes. To make the resemblance to the tropical forest more complete, a diminutive species of *Ficus* (*F. pumila*) creeps over the walls and ascends the pillars. Other flowering plants, especially species of *Billbergia*, relatives of the Pineapple, are also to be seen here, growing upon the trunks of trees.

Entering this House by the southern door, the first species to attract notice will be the tree ferns in the central bed, where several specimens of *Dicksonia* and *Cibotium* are to be seen. The dense woolly covering to the bases of the fronds in the last named genus is quite remarkable. In this bed are two particularly fine specimens of *Angiopteris hypoleuca* from Java. This genus belongs to the family Marattiaceae, which probably dates back to Palaeozoic times and was particularly widespread in the Jurassic and Triassic epochs. Another member of this family, *Marattia attenuata* from New Caledonia, is to be found growing in a pot on the central staging.

The tree fern *Alsophila crinita* from South India and Ceylon does very well in this House.

Turning to the right the collection of *Adiantum* spp. or Maidenhair Ferns will be seen on the staging to the right. This genus though mainly tropical is very widely represented and one species, *A. capillus-veneris*, occurs as a rare plant in Britain. Just opposite this collection on the central staging will be seen species of *Cheilanthes*, the underside of the fronds of which are white with a waxy secretion. Hereabouts are also the species of *Davallia*, very decorative ferns with finely divided fronds. These ferns are usually called 'Hare' or 'Squirrel-Foot' ferns from the fancied resemblance of the scaly creeping rhizomes to the feet of these animals.

Several species of *Lygodium* are supported by wires ascending to the roof. These climbing ferns are very common in the tropics where they are often found forming dense tangles in forest openings.

On the central stage to the west is a collection of *Nephrolepis* showing the numerous varieties with much divided fronds, which have been produced under cultivation. Here also will be found on the staging to the south the gold and silver ferns, *Pityrogramma* spp., which are frequent in the tropics and have got their common names from the white or yellow waxy covering on the undersurface of the fronds.

The Stag's-horn Ferns (*Platycerium*) are remarkable ferns and they may be seen on most of the tree trunks which serve as supports for the epiphytic ferns. This genus of ferns has two types of leaves. One type is pressed close against the trunk of the tree. In the pocket thus formed there collects water and debris—dead twigs, dead leaves, organic matter and dust—which continually falls from the canopy of a forest. This debris eventually forms humus into which the roots of the plant grow and obtain the food necessary for its development. The other type of leaf is pendulous and forked once or twice, and on these fronds the spores are borne. A number of other epiphytic ferns collect humus and moisture in a similar way, but it is not always that a sterile leaf is developed for this purpose, sometimes the base of the fertile frond is adapted for this duty (*e.g., Drynaria quercifolia*).

On the north-east staging will be found the collection of Selaginellas. These are closely related to the Lycopodiums or Clubmosses, and like the Ferns, have a life history of two phases. The leaves of most species are of two sizes and are arranged in two ranks on flat dorsiventral stems, which branch fanwise. The upper surfaces of the leaves of some species show iridescence due to diffraction of the light that falls upon them (e.g. *Selaginella vogelii*).

With the Selaginellas are also to be found various species of Club Moss (*Lycopodium*) of which many occur in tropical lands, some creeping, some shrubby, and some epiphytic, with five species in the British Isles. In this house too will be found pots of *Azolla*, a minute waterfern which forms by aggregation enormous red or green patches upon standing water.

The Filmy Fern House (2a), open in the winter months only, is devoted to the culture of various ferns which demand conditions of shade and high humidity, owing to the delicacy of their fronds. Here will be seen species of *Hymenophyllum*, a genus represented in Britain, which can reproduce itself vegetatively by rooting at the tip of the frond. Should the latter touch the soil a new plant will arise from the rooting tip. There are numerous species of *Trichomanes* from Europe, America and New Zealand, including *T. radicans* with its varieties, one of which is found in Ireland. *Cardiomanes reniforme*, with kidney shaped leaves, also seen here, comes from New Zealand. *Leptopteris moorei*, resembling a tree fern on a small scale, is a native of Lord Howe I., which although not a member of the same family has the same type of filmy foliage. This House is maintained at a temperature of 55°–65°F., and the plants are sprayed with water twice a day. The plants grow in the dim light characteristic of the interior of an evergreen forest. The fronds of these ferns are very thin and delicate, almost transparent.

The Cool Fern House (No. 3) contains many of the ferns which, although found in many of the cooler parts of the world, are not hardy in Britain. The House is maintained at a temperature of 50°–65°F.

In the central bed are to be seen species of the royal ferns, *Osmunda*, a geologically ancient genus which is also of interest because the sori are borne on the upper part of certain fronds which are modified for the purpose, and which bear little resemblance to the tips of the ordinary leafy fronds. In this bed will also be found *Dicksonia arborescens*, a tree fern from St. Helena. The specimen of the South African tree fern, *Hemitelia capensis*, should be noticed. The moss-like growth covering the apex of the stem, formerly mistaken for a species of filmy fern, actually consists of modified fronds.

A Stag's Horn Fern, *Platycerium alcicorne*, from Australia, is also grown epiphytically in this House. On the staging is a selection of ferns which are usually cultivated in greenhouses in this country as being not quite hardy in our climate. One of these is *Asplenium bulbiferum*, upon the fronds of which will be seen small bulbils each of which can develop into a new plant.

A small exhibition of prothalli, the sexual generation of the ferns, with young fern plants (*sporophytes*) arising from them, is usually staged, with diagrams, on one of the side benches.

A number of the fern allies are to be seen in this House. *Marsilea*, whose leaves have four lobes like a four-leaved clover, and 'sleep' at night in the manner of Wood Sorrel, should be noticed. The spore-bearing organs are on or under the surface of the soil. There are also specimens of the genera *Pilularia*, *Isoetes*, *Azolla*, *Salvinia* and *Psilotum*. A few Liverworts are to be seen in the House.

A number of decorative climbers (*Lapageria*, *Bomarea* spp.) are also to be seen climbing up the walls. One of these, *Philageria veitchii*, is a hybrid between the two liliaceous genera *Philesia* and *Lapageria*, both from Chile. This hybrid has very dark red flowers.

THE CONSERVATORY

(*House No.* 4)

This House, which is shaped like a cross, is perhaps the most popular, since in it are to be seen examples, varying with the season, of the more decorative flowers with which every amateur gardener is familiar. In addition there are permanent features in the House, namely climbing plants which ascend to the roof, and the shrubs and small trees planted in beds in the east and west wings.

In the south wing attention may be drawn to the species of *Fuchsia*, particularly *Fuchsia magellanica*, and a Honeysuckle, *Lonicera sempervirens* from North America, with pretty pinkish red flowers in the AUTUMN. The climbing potato, *Solanum jasminoides*, is covered with its white blossoms in SUMMER. During the SUMMER the profusion of pale blue flowers of *Plumbago capensis* is conspicuous.

In the eastern wing there are a number of interesting shrubs and small trees planted in the centre bed. *Callistemon citrinus*, commonly and aptly called the Bottlebrush, because its flowers with numerous stiff red stamens spread all around the tips of the branches, is an Australian tree and flowers in SPRING. The two Acacias with their feathery foliage, and the *Grevillea oleoides*, also come from Australia. The 'Crane Flower', *Strelitzia reginae*, is a South African plant allied to the Bananas. *Tibouchina semidecandra*, with flowers of the most delicate clear violet, comes from Brazil. Of the climbing plants against the wall, *Abutilon insigne*, from Columbia, with its dull red shapely blossoms, should not be missed. Beside it on the eastern wall is a climbing Cassia, *Cassia corymbosa*, from North America. Farther on *Fuchsia microphylla*, from Mexico, with its small leaves and minute flowers, should be compared with some of the other large-flowered species of this genus to be found in the House.

In the northern wing the beautiful blue-flowered climber *Clerodendrum ugandense* can be compared with *C. splendens*, a crimson-flowered species, both of which are exhibited here.

In the west wing the western wall is covered with the spreading branches of *Macleania punctata*, from Ecuador, a climbing plant allied to the Blaeberry.

This wing is also made beautiful by climbing roses, *Bougainvillea*, *Lapageria* and other striking plants. In the central bed the most conspicuous plant is the Seville Orange, *Citrus aurantium*, but there are also several species of *Camellia* which produce their beautiful flowers in SPRING.

On the staging around the walls of the House, and in the central beds of the north and south wings, a display of flowering plants changes with the seasons.

In SPRING are to be seen here the early flowering bulbs, such as Daffodils, *Narcissus*, and Hyacinths. With these are species of *Clivia*, *Hippeastrum*, *Cineraria*, *Isoloma*, *Aquilegia*, *Cyclamen* hybrids, and in late spring, *Hydrangea*.

In SUMMER the House is ablaze with Calceolarias, Gloxinias, *Nicotiana*, *Salpiglossis*, *Schizanthus*, Gardenias, and other plants. Towards the end of the SUMMER, varieties of *Pelargonium*, popularly known as Geraniums, have an extended flowering season.

In AUTUMN there is a fine display of tuberous and other Begonias, *Streptocarpus*, Balsams and *Achimenes*. Numerous plants of *Coleus* with fantastically variegated leaves are displayed in the central beds, which are also beautified by the presence of shrubs like *Erythrina crista-galli*, 1–2 year old plants of *Eucalyptus*, *Grevillea* and others.

In the WINTER it is the Chrysanthemums which provide the chief display, but towards the end of the WINTER the early Primulas such, as *Primula obconica*, *Primula malacoides*, and *Primula* × *kewensis* begin to appear.

Features of this House are the hanging baskets, which show off species of *Fuchsia*, *Lobelia*, and *Begonia* to perfection.

THE SUCCULENT HOUSE

(*House No.* 5)

The Succulent House is devoted to the culture of a selection of plants which are characteristic of the dry and desert regions of the earth.

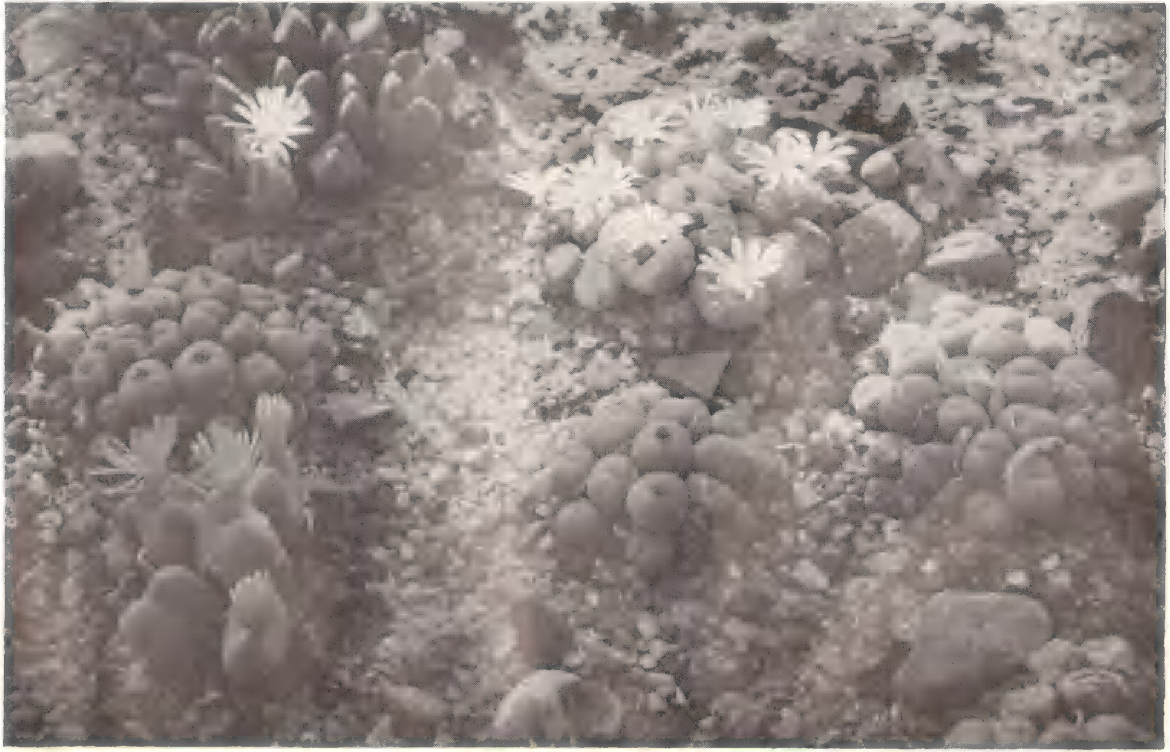
Plants which live in such situations and which have to endure long periods of drought, must possess, if they are to survive, (*a*) the means of storing water, and (*b*) features which prevent too rapid evaporation from their surface. Various parts of such plants serve for storage. Stems or leaves are thick and fleshy, or the underground system may be tuberous and often reaches a very large size, or all parts of the plant may be fleshy. Too rapid a desiccation is retarded by the following features, either singly or in combination:

(*a*) a relatively impermeable surface;
(*b*) suppression of leaves altogether, or their reduction to spines so that there is considerable mechanical resistance to the shrinkage consequent upon water loss;
(*c*) shedding of leaves in the dry season whether due to frost or heat;
(*d*) close juxtaposition of leaves;
(*e*) a covering of hairs which reflect the light and retard water loss.

From the deserts of the S.W. United States, Mexico and Peru, come the collection of cacti, Agaves (*Amaryllidaceae*) and Nolinas representing the succulents of the New World, whilst some of the plants assembled from the Old World are the fleshy leaved Aloes, Euphorbias which closely resemble some kinds of cacti, Cotyledons, Crassulas, and fleshy Senecios.

This all-metal house, erected in 1956, is divided into two parts by a partition. The northern section is maintained in winter at a temperature of 60°–65°F. while the southern section will be some 10° cooler.

In the northern section an interesting feature of the plants in the central bed is the resemblance between the arborescent species of *Euphorbia* and certain species of the cactus genus *Cereus*. The external morphology is often so close that one may easily be mistaken for the other. The Euphorbias, however, possess a character which is absent from the cacti, namely, the presence of a milky latex in the tissues. These fleshy Euphorbias have spiny or smooth stems without leaves; the leaves are small and only last for a short time. The function of the leaves is performed by the green tissues of the stem. In the central bed



Species of Conophytum resembling pebbles are also to be seen the tropical species of *Aloe* growing in tubs. The well known purgative 'aloes' is obtained from the leaves of certain species of this genus.

The strange looking plant with the rosette of silvery recurved toothed leaves in the north-east corner of the House is *Hechtia argentea*, a native of Mexico and a member of the Pineapple family. This specimen must be over 100 years old and produces annually one or two slender scapes of white female flowers.

On the staging and shelves will be seen collections of succulents and cacti. One of the more interesting cactus genera seen here is *Rhipsalis* with flattened ribbon-like stems, one species of which is the only species of cactus found in the Old World. In the southern section of this House the most interesting species, botanically speaking, is *Welwitschia bainesii*, which grows in the deserts of South West Africa. It is an extraordinary plant inasmuch as the trunk never exceeds 2 feet long but has a flat top which may reach a diameter of 5 to 6 feet. From two depressed grooves within the margin at the top emerge two enormous leathery leaves 6 to 7 feet long, which eventually split to the base into thongs which curve and undulate over the soil. The plant is said to attain an age of 100 years.

In the central bed will also be seen species of *Furcraea*, the large fleshy leaves of which contain a fibre known as Mauritius hemp, which is highly prized. This plant is a native of Brazil and is said to have been introduced into Mauritius about 1790 by a Jesuit missionary. At the present time all the bags used in the very considerable export of sugar from Mauritius are made from this fibre. One of the Agaves, *Agave sisalana*, also possesses a fibre in the leaves, sisal, which when extracted by suitable machinery is made into cordage.

Another plant of interest here is the South African *Testudinaria elephantipes* whose grotesquely swollen corky and hemispherical bases, known as 'Hottentot's bread', produce annually slender climbing stems. The Black Bryony of our English hedgerows is a relative of this plant.

In the central bed are several species of *Nolina* and *Dasylirion*, belonging to the Lily family and native to Mexico. The short trunks are surmounted with a tuft of evergreen, closely crowded, sharp leaves. The lower leaves hang down and partly cover the stem. They are very tough and are used for thatching, and can be woven into baskets, brooms, coarse mats and the like. They also contain a fibre which can be made into cordage. Here also are several species of the genus *Strelitzia*, of the Banana family, which produce their extraordinary flowers in SUMMER.

The benches are occupied by fleshy species of *Aeonium, Cotyledon, Crassula, Sedum*, and *Kalanchoe* belonging to the Stonecrop family (*Crassulaceae*), natives of the Canaries and South Africa. Among them will be found a specimen of *Cissus juttae*. This monstrosity, a member of the Vine family, reaches a height of 6–9 feet in south-west Africa, and the whole stem, soft as the flesh of a turnip, is adapted for the storage of water. The branches are only a few inches long and produce a few glossy leathery leaves and the inflorescences. *Bowiea* (*Schizobasopsis*) *volubilis* will also be seen on the staging. The base of this plant is like a large green onion from which a slender succulent climbing stem emerges which bears flowers towards the apex. The green tissue of the inflorescence takes on the functions of the absent leaves.

THE 'T' RANGE OF GLASS HOUSES
(*Houses Nos.* 7–14)

The Houses which occupy the area to the east of the Rock Garden are known as the 'T Range' because the main structures are grouped like that letter. The Giant Water Lily, *Victoria amazonica*, is grown in the central and hottest part of the range. The Houses 7, 8 and 9 forming the stem of the 'T', contain respectively Cape plants, Begonias and Tropical Stove Plants, with the Pitcher Plant, or Nepenthes House adjoining; Houses 11 and 12, forming one arm of the 'T', contain Economic Plants, whilst Houses 13A, 13B, 14A and 14B, forming the other arm, are devoted to Orchids. The temperatures at which the various Houses are maintained will be found in brackets after the House number.

Entering No. 7 by the north door one can pass to the left into the Sherman Hoyt Cactus House, No. 7A (60°–55°F.). This House was most generously presented to the Gardens by Mrs. Sherman Hoyt of Pasadena, California, to contain the Cacti and other American plants which she had exhibited at Chelsea Flower Show in 1929. It joins the stem of the 'T' at its base and thus obscures the original plan. The painted background of the House represents the Mohave desert, where a good many of these plants are native. One realises here the striking uniformity of habit developed under extreme conditions. Adjoining is a small House which contains a selection of succulents from very dry regions. Here will be found that extra-

Sherman Hoyt Cactus House

ordinary plant genus *Lithops*, the species of which appear to mimic the very stones among which they are found. Small specimens of *Aloe*, *Haworthia*, *Crassula* and others will be found here and the collection as a whole illustrates the development of the succulent habit in quite unrelated families.

Returning to House No. 7 (62°–58°F.), the middle staging will be seen to be occupied by a fine collection of species of Heath (*Erica*), from the Cape, the other great centre for this genus being the Mediterranean. The unpleasant smell at the southern end of the House comes from *Barosma foetidissima*, a South African shrub belonging to the Rue family.

In the SUMMER time the east staging is occupied by species of colourful *Achimenes* (*Gesneriaceae*), a genus of interest because of its peculiar underground shoots, which bear crowded scaly leaves. Later in the season a succession of beautiful plants is displayed including *Exacum*, *Haemanthus*, *Beloperone*, *Veltheimia*, etc. Several species of *Ipomoea*, with beautifully coloured bell-like flowers, climb to the roof.

The central stage and side stages of House No. 8 (65°–62°F.) are given over to a selection from the very large genus, *Begonia*, of which there are between 700 and 800 spp., most of which come from South America. It should be noted that the leaves of a Begonia are asymmetrical and rather like an elephant's ear. *Begonia socotrana* (from the island of Socotra) is, however, an exception and possesses regular peltate leaves. On the side staging may be seen many species of Balsam (*Impatiens*) in the SUMMER and *Gloxinia* in the AUTUMN. The tropical *Ixora* (*Rubiaceae*), grown as a pot shrub, with flame-coloured flowers, may also be seen here in the SUMMER. Various tropical flowering plants are also displayed in their proper seasons. The Sensitive Plant (*Mimosa pudica*) is one of the more interesting plants grown in this House.

Under the roof the Climbing Lily (*Gloriosa*) clings by means of a tendril which is the continuation of the mid-rib of the leaf. Several species of climbing *Clerodendrum* (*Verbenaceae*) can also be seen here, among which *C. thomsonae*, with a deep scarlet corolla surrounded by an inflated, very pale calyx, is most attractive. Here too are species of Dutchman's Pipe (*Aristolochia*) so called from the remarkably shaped flowers.

House No. 9 (75°–70°F.) is filled with a miscellaneous collection of Tropical Plants, many of them native of tropical forests and which are characterised by the beauty of their foliage rather than of their flowers. Such were cultivated in the past under the name of Stove

Plants. The family *Bromeliaceae* (to which the Pineapples belong) occupies most of the staging on the east side of the House. The family is entirely American and is usually found epiphytic upon the branches of trees in tropical forests. The base of the leaf forms a cup in which a considerable amount of water can collect.

On the central stage are two interesting specimens from Natal, with fern-like foliage, which belong to a very primitive family, the cycads. These are a male and a female plant of *Stangeria paradoxa*. The main collection of cycads is, however, to be found in the Palm House. Another conspicuous plant is *Coccoloba pubescens*, with very large circular leaves belonging to the same family as the Docks and Buckwheat.

Clusia grandiflora also stands on this middle stage. It bears large pink disc-like flowers in SPRING.

Various members of the family *Euphorbiaceae*, with ornamental leaves, such as Crotons (*Codiaeum*), are also grown in this House, but are not to be confused with the true Crotons from which Croton oil is obtained.

A number of beautiful climbers ascend to the roof. *Jasminum rex*, with large white, deliciously scented flowers, is one of them, but spp. of *Gloriosa*, *Combretum*, and *Clerodendrum* add beauty and colour to an already colourful House.

The Pitcher-Plant House is situated alongside House No. 9 and contains numerous species of *Nepenthes* in hanging baskets. These extraordinary plants are natives of Indo-Malaya and Madagascar, where they generally grow in steamy bogs and climb over other vegetation by means of their tendrils. These tendrils are prolongations of the mid-rib of the leaf, and the pitchers are developed at their tips. The pitcher itself shows a considerable diversity of form. It is, roughly speaking, bag-shaped and possesses a small hood over the opening at the top. Noteworthy species here are *Nepenthes rafflesiana* and *N. formosa*, which produce very large pitchers. The pitchers contain a fluid into which digestive ferments are secreted when insects fall into it, so that their proteins become available to the plant and provide a source of nitrogen. The smooth inner surface of the pitcher bears glands which secrete delicate flakes of wax which immobilize the adhesive feet of flies, and thus cause them to fall into the liquid in the pitcher where the insects are eventually digested.

The beds on both sides of the central path in the House are filled mainly with species of the South American aroid genus *Anthurium*. The species of this genus possess attractively variegated leaves and flower-spikes with crimson spathes, which are flat instead of surrounding the inflorescence, as in our native Cuckoopint.

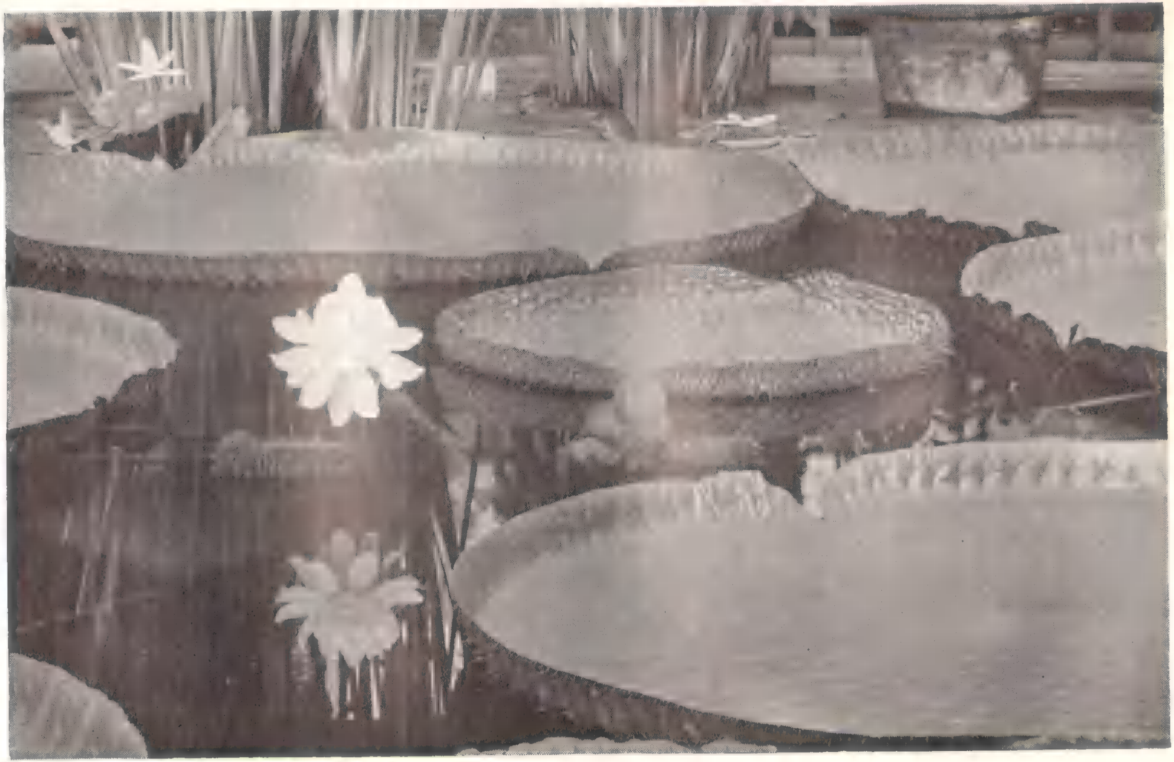
House No. 10 (75°–70°F.: tank maintained at 80°F.) contains the GIANT LILY TANK in which *Victoria amazonica*, the great Amazon Water Lily grows. The seed is sown in January in pots and the pot containing the young plant is put into the tank in June. In the space of three months the water surface is covered with the giant leaves which can reach a diameter of six feet. They have an upturned rim so that they constitute a flat-bottomed boat, and are sufficiently buoyant, if a board were placed upon one to distribute the weight, to support a child. The flowers, produced in late SUMMER, open in the evening and are at first pure white in colour but fade to pink or purple-pink within 24 hours. The water between the leaves is covered with a floating aroid, *Pistia stratiotes*, and there is also another water lily, *Euryale ferox*, with large flat leaves but without an upturned rim. The staging in the House supports a large number of species of *Bromeliaceae*. Underneath the staging on the east and north sides will be found a thick growth of two tropical Tradescantias.

Round about the tank and at its corners are to be found specimens of sugar-cane and rice, as well as pineapples. During the WINTER the tank is occupied by pots of *Medinella*, a large shrub with pendulous pink flowers.

During the SUMMER, the House is gay with climbing shrubs, among which the tropical liane *Allamanda* is conspicuous by its bright yellow flowers. Other tropical climbing plants to be seen are species of *Odontadenia*, *Passiflora*, *Ipomoea*, and *Thunbergia*.

To the south of House No. 10 is a cool annexe (11A) (60°–55°F.) in which a variety of insectivorous plants are grown. Here will be seen a wide variety of Sundews (*Drosera* spp.) which catch and digest small insects by means of sticky glandular hairs, and Pinguiculas with broad leaves that act as fly-papers. Both these genera secrete digestive ferments which are poured over their prey, eventually assimilating them. The Sarracenias, with long and often brightly coloured pitcher-leaves which contain water, deal with their prey as does a *Nepenthes*. In the Darlingtonias, on the other hand, which have leaves like long hooded funnels, true digestion, that is, by means of a secreted enzyme, is not known. It seems that these plants depend solely upon the activity of bacteria to break up the bodies of insects and to make available the proteins which can be absorbed through the walls of the leaf-pitchers.

To the west of 11A is a long cool House (58°–53°F.) devoted exclusively to the Cape Pelargoniums (No. 12A) and illustrating



Victoria amazonica (*V. regia*)

the remarkable range of habit that can be exhibited by members of a single genus. Here will be seen *Pelargonium inquinans* and *P. zonale*, the parents of the garden 'Geraniums', with some of the early hybrids. The shoots of *P. tetragonum* are fleshy like those of a *Euphorbia* with inconspicuous leaves. *P. bowkeri* has a tuber-like, fleshy stem. Other species, e.g. *P. radula*, have feathery dissected leaves like Cranesbills, yet others have simple leaves like the scarlet Pelargoniums of our gardens. The flowers of these are actually spurred but the spur is fused with the flower-stalk.

The Orchids are displayed in four Houses to the east of House No. 10. While the collection of orchids at Kew runs into many thousands, only those which are in flower or are about to open their flowers are placed on public display. During the late WINTER the Houses are at their best, whether on account of the gorgeous colours of the orchid flowers or for their fantastic shapes, all as Darwin showed, related to specialised pollination by insects. Most Orchids are epiphytes, that is, they occur normally on the trunks or branches of trees, where their thick roots creep over the bark or hang down into the humid atmosphere. These roots are highly specialised and have the remarkable faculty of being able to absorb moisture from the air. They appear white and opaque when dry, greenish and slightly translucent when moist. A good many orchids, however, are terrestrial and all our British species belong to this class—these obtain their water requirements in the ordinary way. Actually, however, orchids are better adapted to utilise intermittent rainfall than many other plants, since they possess very efficient organs for water storage, and moreover, their thick leathery foliage is adapted to withstand the harmful effects of desiccating winds and the high tropical insolation. The storage organs in orchids take the form of bulb-like growths, the pseudo-bulbs, which actually are swollen stems, and bear leaves, as for example in the genera *Odontoglossum*, *Oncidium*, *Coelogyne*, *Bulbophyllum*, and others; or the stem may be elongated as in most species of *Dendrobium*, *Epidendrum*, *Vanda*, etc., with a regular succession of leaf-bearing nodes and more or less elongated internodes.

Perhaps the most interesting feature of orchids is that of the association of a fungal mycelium with the orchid plant. This state is not that of parasite and host, but rather one of symbiosis, a condition in which the plant and fungus are partners, whether temporary or permanent, as it were, each contributing something to the well-being of the other. The seeds of orchids are exceedingly minute, but in nature the fungus assists nutrition which discounts the meagre provision for the offspring. Orchid seeds will, however, germinate quite freely on a suitable nutrient medium without the fungus, and will even grow to maturity, producing flowers and fruits.

Returning to House No. 10, leave by House No. 13A (60°–55°F.) which is on the right hand side, and enter a warm House which is devoted to species of the genera *Dendrobium*, *Catasetum*, and others. A good many of these are grown on dead logs of wood simulating their natural habitat. On a stage over the small tank near the partition door, will be found a collection of orchids which serve to extend one's conception of the range of habit and bloom in this enormous family. In this House there is a fine specimen of *Vanda lowii*.

Passing on into House No. 14A (58°–53°F.), the cooler extension of 13A, *Odontoglossum*, Masdevallias and some Cymbidiums are met with.

Entering House No. 14B (63°–58°F.), which is intermediate in temperature, one can see the species of slipper orchid (*Paphiopedilum*) which live in a cool climate, Miltonias (Trop. America), which look like pale pansies, Epidendrums (Trop. America) and the collection of Cymbidiums (Tropics of Old World).

In the next House, No. 13B (70°–65°F.), a warm house, one can see a fine collection of tropical slipper orchids (*Paphiopedilum*, *Phragmopedilum*), with a large bag-like lip (the shoe), and sometimes long narrow petals like whiskers. Here also is the great white *Angraecum sesquipedale* from Madagascar with a spur or nectary as much as eighteen inches long. Numerous species of *Bulbophyllum* from the East Indies are to be seen here. Species of *Phalaenopsis*, *Saccolabium*, *Vanda*, etc., are displayed in this House as they come into flower. The climbing orchid seen on the roof belongs to the genus *Vanilla*, which furnishes the pods from which the well-known flavour is obtained.

Certain other plants growing in pots will be noticed in the Orchid Houses, and one genus of these, *Saintpaulia* (The Cape Violet), belongs to the tropical and sub-tropical family *Gesneriaceae* only represented in Europe by the Ramondias. These plants have pansy-like flowers, ranging in colour from white through wine colour to deep violet, and possess two bright yellow stamens in the centre. Two sedges, *Carex brunnea* and *Scirpus cernuus*, are also grown in pots along the edges of the staging in order to make an attractive setting for the orchids.

ECONOMIC HOUSES

(*House Nos.* 11 *and* 12)

There are two Houses devoted to a display of the more important economic plants from tropical and sub-tropical regions. Here will be found plants utilised in various ways as the sources of Drugs, Gums, Resins, India-rubber, Gutta-percha and fibres which can be used for making cloth and ropes. Here also are other plants valued for their fruits.

Visitors should remember that many of the plants grown in these Houses, some of them in pots, are large trees or high climbing scramblers in their native homes and therefore only convey a partial impression of their habit.

House No. 11 (70°–65°F.). This House forms the western portion of House No. 10 and is only slightly cooler. In it are found a number of tropical plants which are of very great value to mankind. Most of the species which yield rubber are to be found here, among them the Rubber Vines (*Landolphia*), an African genus which climbs to the roof of this House, the West African Rubber Tree (*Funtumia*), Para Rubber (*Hevea*), and species of *Castilloa*, *Manihot* and others.

The Granadilla (*Passiflora quadrangularis*), a climber, is also represented, as are fruit trees which yield guavas (*Psidium*, Myrtaceae), mangosteens (*Garcinia*), papaws (*Carica*), and mangoes (*Mangifera*, Anacardiaceae). The Cacao (*Theobroma cacao*) produces its flowers on the stems, and these are followed later by large pods that contain the seeds known as cacao beans, from which cocoa (for drinking) and chocolate (for eating) are manufactured. The trees which are the source of Cinnamon, Nutmeg and Allspice, may also be seen in this warm House.

House No. 12 (60°–55°F.) contains a fine collection of shrubs and small trees which yield citrus fruits. The Metford Lemon bears very large fruits. It was first noticed in the garden of Miss Metford, Hook House, Taunton, where it was raised from seed early in the nineteenth century.

The pods of the Carob Tree (*Ceratonia siliqua*), known as Carob or St. John's Bread, are largely used for feeding animals in the Mediterranean area. The Indian Rubber Tree (*Ficus elastica*) grows in this House, as do the Olive (*Olea*), the Pomegranate (*Punica*), the Tea Bush (*Camellia sinensis*) and several species of *Cinchona*, from the bark of which quinine is obtained. Grape vines climb to the roof.

On the soil below the small trees species of the Groundnut (*Arachis*) have been planted. They are so called because the fruiting branches are thrust into the soil by their growth and ripen below the surface.

WATER LILY HOUSE

(*House No.* 15)

This House is entered through a small portico. Inside to right and left are beds in which are grown species of *Hibiscus*, *Gardenia* and *Strobilanthes*. The most remarkable of these is *Hibiscus schizopetalus*, from Tropical Africa, whose pink petals are finely dissected and divided. Tropical climbers such as *Clerodendrum thomsonae*, *Bougainvillea*, and *Gloriosa* climb upon the walls.

In the body of the House is a large, circular tank which was originally constructed in order to accommodate the Giant Lily, *Victoria amazonica*, now grown in the 'T Range' (see page 44). Species of the Water Lily genus *Nymphaea* are cultivated in this tank in submerged pots. One of the more attractive of these is the rare white form of *Nymphaea gigantea*, whose native home is Queensland, Australia. The large, white, scented flowers are produced during the SUMMER. Among these plants will be found the beautiful Egyptian lotus (*Nymphaea lotus*) and its varieties with white or red flowers.

One of the more interesting plants in this House is *Nelumbo nucifera*, the sacred 'bean' or 'lotus' of India and Japan. In India it is a common plant in the water tanks beside Hindu temples, where the fibre of the stem is made into wicks which are burned at Hindu ceremonies. The delightful rosy-pink flowers are held high above the water on long stalks, and the peltate leaves, too, which float when young, are raised above the surface as they grow older. The flowers, which are deliciously scented, are at their best, like so many water lilies, in the early morning. The seed vessels are curious, resembling the rose of a watering can. The seeds are known to be able to retain their viability for over 200 years.

Ipomoea digitata, a beautiful tropical creeper, with pinkish-mauve flowers, climbs along the circular wall of the tank. In pots, supported at water level, are cultivated species of *Hedychium* and *Acalypha*. *Hedychium coronarium* is not only an attractive and beautifully scented plant with yellow flowers streaked with red, but is also useful to mankind on account of its fibre, which can be made into an excellent paper. 'Red Hot Cats' Tails' is the name given to *Acalypha hispida*, on account of the long drooping red inflorescences made up of very many minute, sessile, red flowers.

On the northern side of the tank, planted in damp mud, is the Papyrus of Egypt (*Cyperus papyrus*). The characteristic floating vegetation of the upper Nile, known as the 'Sudd', is composed mainly of this plant, which actually is a sedge, and it was used exclusively in Egypt in ancient times for the making of paper.

On the staging around the walls are grown a number of ornamental plants with variegated foliage. In three of the corner beds are grown aroids with very large leaves. One of them is *Colocasia esculenta*, a tropical plant, which produces very large underground tubers containing large quantities of starch. These are eaten in the tropics as a substitute for potatoes. The other plant is *Alocasia macrorrhiza*, also tropical and containing edible starch in the stem. The starch must be carefully prepared by washing and cooking before consumption as the uncooked stem is suspected of containing the highly poisonous hydrocyanic acid.

A tropical vine climbs along the bar close to the roof over the central tank. This plant is the Bottle Gourd or Calabash cucumber, *Lagenaria leucantha*. When the fruit is ripe the interior, pips and pulp, can be scooped out leaving a vessel which can be used to contain fluids. Before crockery and metal vessels became available, these gourds enjoyed a great vogue everywhere in the tropics, and even today are much prized in backward areas. The future bottle can be moulded to any shape required while the gourd is still young by binding it with strips of cane. As will be seen in the living plant, aerial roots are sent down which branch and rebranch when they touch the surface of the tank, becoming adapted for the absorption of water. In WINTER the temperature in this House is 55°–65°F., in SUMMER 75°–95°F.

THE ALPINE HOUSE

(*House No.* 25)

This unheated House is situated to the north of the Herbaceous Garden and close to Museum II. It is really an appanage of the Rock Garden and serves for the display of alpine and other delicate plants in pots when in flower. Here plants whose blossoms would suffer damage if exposed to rain are seen to far greater advantage when protected than if exposed to the elements in the open. The House is open from late winter onwards. At the beginning of the year the bulbous plants make the more important display, and many beautiful kinds of Crocuses, Daffodils, Snowdrops and bulbous Irises are seen at their best at this time of the year. They are followed closely by the hardy Cyclamens, several species of Saxifrage, a number of beautiful Primulas, Chionodoxas, Fritillaries, Scillas, Hyacinths, etc. These are followed by a succession of handsome alpines and as many as one hundred species of beautiful flowering plants may be on display in the House at one time.

THE PALM HOUSE

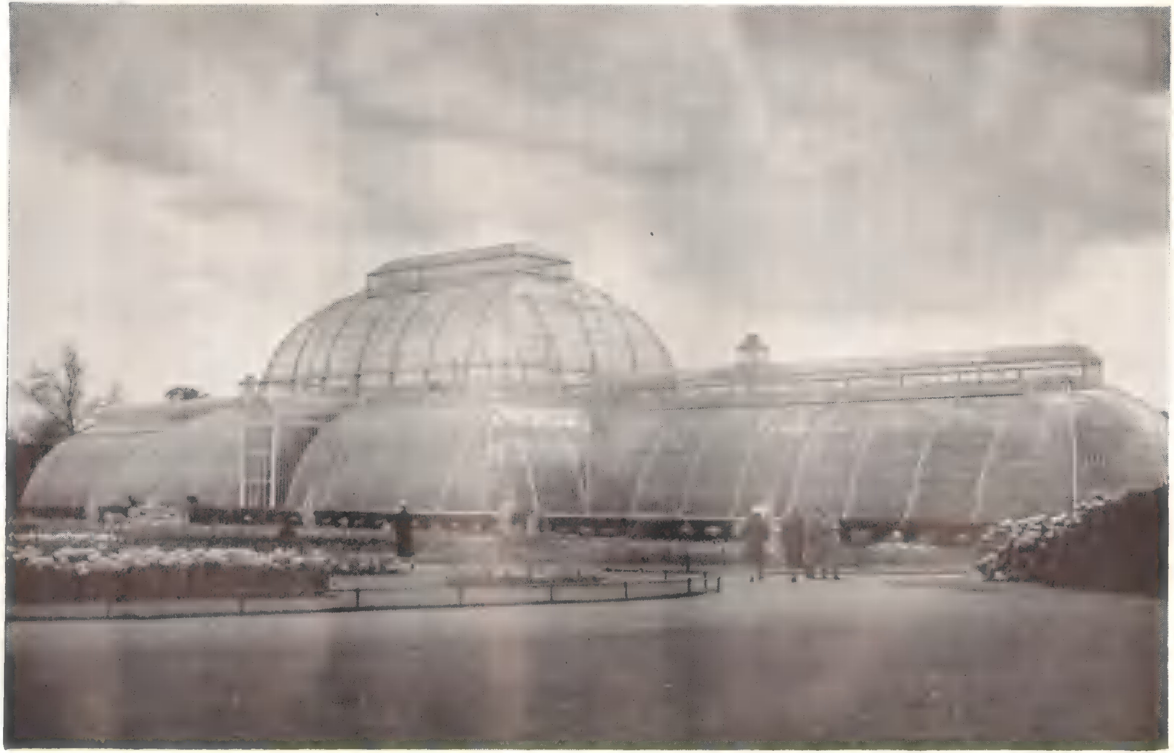
In this House are gathered together plants from the tropics of both hemispheres, palms and cycads being a conspicuous feature. It is maintained at a temperature of 50°–65°F. in WINTER, and at 70°–80°F. in SUMMER.

Entering by the south door (nearest to the Victoria Gate), the visitor will immediately notice the collection of cycads which occupies the central portion of the southern wing. These plants, popularly known as 'palms', from the fact that the leaves of one of them, *Cycas revoluta*, are in great demand on Palm Sunday, are members of a group which has a very ancient history, and are more closely related to the conifers than to any other groups. They have mostly tuberous or columnar stems which are clothed with an armour of the bases of old leaf stalks, while the pinnate leaves form a whorl at the summit. The leaflets are leathery and often toothed or spiny. In appearance they resemble palms or tree ferns, but *Stangeria*, a South African genus (to be seen in House 9, 'T Range') is more like a fern than anything else, and was actually first described as such under the name of *Lomaria*. In geological times (some 80 million years ago) the ancestors of the present day cycads were numerous and widely distributed, but there now remain only about nine genera confined to the tropical and sub-tropical regions. Of these nine genera, five belong exclusively to the eastern, and four exclusively to the western, hemisphere. The distribution of the individual genera is often very restricted. For example, two genera are confined to Australia, two to South Africa, and one to a single province in Cuba. Only one genus in each hemisphere is found both north and south of the equator.

The male and female flowers are produced in cones on different individuals, and examples of the cones may be seen in this House from time to time. The male cones are very uniform throughout the group, but the female cones, which vary in size from small structures only one inch in length to immense cones over a yard long and 100 lb. in weight, have cone scales of diverse form.

Economically the cycads are not of much value, though sago can be obtained from one or two species.

Above the cycads rise tropical trees, grown in tubs, of which the following are of interest. The Looking Glass Tree, *Heritiera macrophylla*, a native of India, which obtains its trivial name from the silvery under-surface of the leaves. The Frangipani, *Plumeria rubra*, with curious thick shoots and beautiful sweet-scented



Palm House. Designed by Decimus Burton. Built 1844–48 flowers, is widely cultivated in the tropics, and especially in India where the flowers are used in Hindu ceremonies. *Brosimum alicastrum*, the Bread-nut of Jamaica, has a tall straight trunk. The round, yellow fruits, about one inch in diameter, taste like hazel-nuts. *Clavija longifolia* is a native of Venezuela, with a tall straight stem bearing a cluster of large, handsome leaves at the top. It produces very large numbers of starry wax-like flowers, deep orange in colour. *Couroupita guianensis*, the Cannonball Tree, is remarkable for the very large, spherical, woody fruits which are borne on the trunk of the tree. Large specimens of the tree *Monodora myristica* are to be also seen in this wing. This species is a native of Tropical Africa, and its fruits are sometimes used as nutmegs. Its popular name is the 'Calabash Nutmeg'.

In the central portion of the House some species are grown in beds while others are grown in tubs. This portion of the House is 66 feet high, and many fine plants are to be seen here. Palms predominate, but there are many other interesting tropical species. Among them are the banana and pawpaw trees, which ripen their fruit perfectly every year. *Carludovica palmata* (*Cyclanthaceae*), a stemless species with leaves shaped and plaited like a fan borne on stalks, six to fourteen feet high, is of interest because panama hats are made from the leaves. The leaves are cut when young and the stiff parallel veins are removed, after which the blade is slit into shreds but not separated from the tip of the stalk. A superior type of hat is that woven from a complete leaf. The Traveller's Tree, from Madagascar, *Ravenala madagascariensis*, is also to be seen here. It gets its trivial name from the fact that in the axils of the banana-like leaves a supply of water is to be found.

The palms form a very natural group which next to the grasses is the plant family most useful to mankind. They supply timber, oils, waxes, fats, starch and sugar, while many household articles in everyday use are made from the fibres of stems or leaves of palms. Two types of leaf only are found, fan-shaped and pinnate, but these vary in size from a few inches up to colossal blades 18 feet long. Some of the species flower every year, while others spend their whole lifetime storing up material for the supreme act of their lives, the production of flowers and seeds, after which they die. One such is the sago palm, *Metroxylon*, the stem of which is packed with sago before it flowers.

The following palms are to be seen in this part of the Palm House. Ivory-nut Palm, *Phytelephas macrocarpa*, the hard seeds of which are the source of vegetable ivory used for buttons, chessmen, etc. *Attalea* *funifera*, a Brazilian species, yields the well-known piassaba fibre which is much used for making brooms. *Howea forsteriana*, from Lord Howe's Island in the Pacific, is a tall palm which produces quantities of crimson fruits. Several species of climbing rattan or canes, *Calamus* spp., can be seen here. These plants climb over other vegetation by means of the spines on the stems and leaves, and may reach a length of 200 yards or more. The split stems are extensively used in tropical countries for basket making and tying materials. The Coconut palm, *Cocos nucifera*, is also to be seen here as well as *Caryota urens;* the former furnishes the well known nuts and the latter can be tapped for palm wine.

One of the most useful of the palms is *Elaeis guineensis*, the West African Oil Palm, which yields the celebrated palm oil, used in the manufacture of margarine. This palm is represented by a small specimen near the south staircase.

A tree which is most attractive when in flower is *Brownea crawfordii*, actually a hybrid between the Colombian *Brownea macrophylla* and the Venezuelan *B. grandiceps*. The tree belongs to the Sweet Pea family and produces large heads of flaming orange-red flowers at the end of the branches or on the old wood, in early SPRING or late WINTER, from buds which may be three inches in diameter. The young shoots of the tree emerge very rapidly and the young leaves, which are brownish-grey in colour, hang down as if they had wilted. After a time they turn green, stiffen and assume their normal position.

Another interesting tree close at hand is *Saraca indica*, the Asoka tree of India. This species, which belongs to the same family as *Brownea*, produces large compact clusters of flowers which are bright orange at first, and afterwards turn red. The young leaves are red in colour, thin and flaccid, and hang vertically downwards for some time after attaining full size.

Towering above the palms are *Dendrocalamus giganteus*, a tropical bamboo, which sends up from the base, stems which reach the roof in one season; *Pachira macrocarpa*, a Mexican tree, which in its native home grows to a very large size; *Carapa guianensis*, from tropical Africa, the seeds of which yield a fatty oil called carap or crab oil, used for burning in lamps. The timber is highly prized. Another tree which is cultivated here for its magnificent foliage is the Anchovy Pear, of Jamaica, *Grias cauliflora*. It is a tall, slender, unbranched tree, terminating above in a large crown of drooping glossy-green leaves which are sometimes as much as three feet long.

On the western side of the central block may be seen the species of *Sansevieria*, the plants which yield bow-string hemp in their native homes in Africa and India. The coffee bush, *Coffea arabica*, also grows here and is covered with scarlet berries in the AUTUMN.

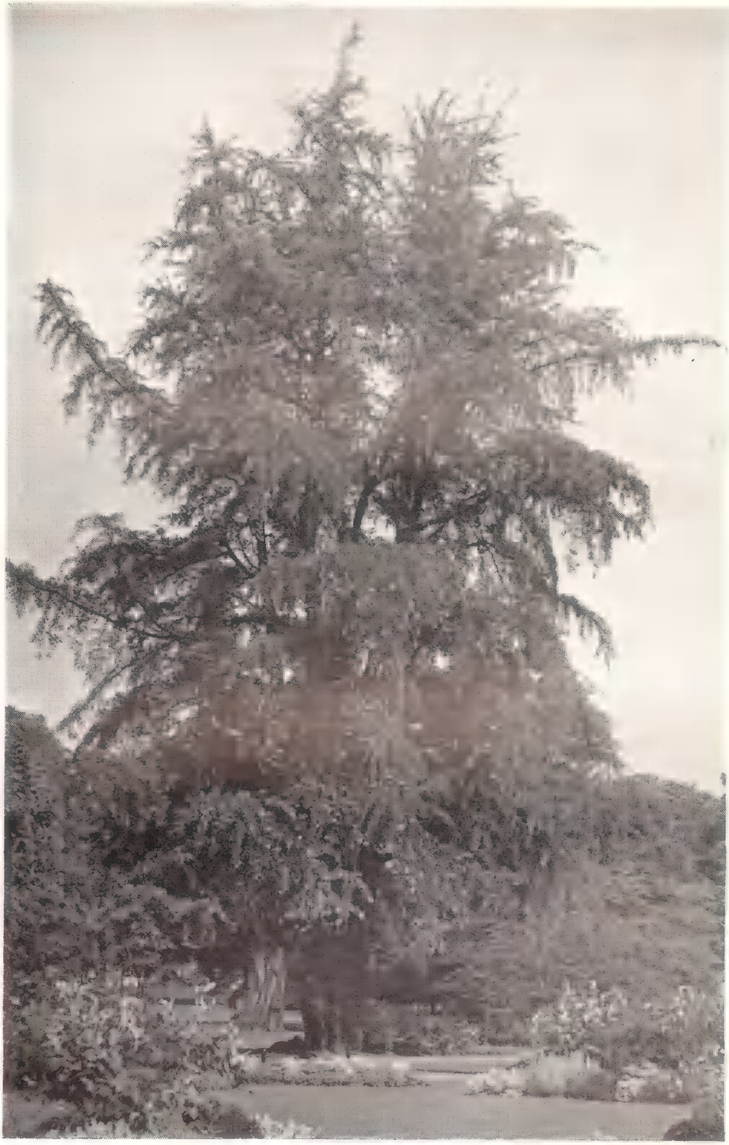
The collection of Screw Pines is to be found in the northern wing. These plants, which have nothing to do with the true pines, are widespread in the tropics of the eastern hemisphere. The long, narrow, tough, leathery leaves are arranged in a triple spiral series at the tips of the branches, forming dense crowns. The stems, which fork repeatedly, are remarkable for the stilt roots that are sent down to the soil. The leaves, which resemble those of the pineapple, combined with the appearance of the spirally marked scars of the leaf-bases, give the members of this genus the popular name of Screw Pine. One of the species, *P. utilis*, native in Mauritius, was of some importance to the Island, in that the fibre of the leaves was used to make the bags in which the sugar produced by the Island was exported. Nowadays this fibre is used for making mats, and the bags are being made from the fibre of another plant (*Furcraea* sp.).

Round the staging of the Palm House are plants grown in pots. Many of these are species which grow into great forest trees, others are ornamental plants grown in gardens in the tropics. Many beautiful tropical climbers may be seen in both wings.

THE TEMPERATE HOUSE

The Temperate House, known to our forefathers as the Winter Garden, is equidistant from the Victoria and Lion Gates, and just west of the Tea Pavilion and North Gallery. Three distinct sections are recognisable, the central one being joined to the terminal portions by two octagonal buildings. The house is devoted to the culture of plants which are not quite hardy at Kew, though a good many of these can be grown out of doors in the warmer climate of south-western England.

Through the north door the visitor enters the Himalayan House, as this section is called. Here will be seen many species of tender Rhododendrons from the Himalayan region, and a few from China. These will be found in flower from February onwards. Immediately inside the door are two pools, one on each side of the path, in which water lilies of the genus *Nymphaea* are grown, and some interesting plants grow around the margin. The long sword-like leaves of the New Zealand Flax, *Phormium tenax*, contain a fibre which possesses amazing strength and has led to the introduction and cultivation of this plant in other parts of the world, where conditions are suitable for its growth. On the right hand side is a fine specimen of the fern



Ginkgo biloba. The Maidenhair Tree

Osmunda regalis and one of the Himalayan bamboos, *Arundinaria hookeriana.* Another bamboo from the same area, *A. falcata*, will be seen in the opposite bed. There are two decorative aroids here, one, *Lysichitum camtschatcense*, with white spathes and *L. americanum* with bright yellow spathes: the specific names denote the homes of these two plants. A sedge, *Cyperus textilis*, also grows here, the stems of which are used for weaving into fine mats. The small creeping plant which grows over the sides of the pools, forming a green mat, is *Helxine soleirolii*, allied to the common Nettle and a native of Corsica, which has become naturalised locally in the south-west of England. In the central beds are grown Rhododendrons and other Himalaya trees. The Weeping Cypress, *Cupressus cashmeriana*, is remarkable for its bluish-green foliage and graceful habit. *Magnolia campbellii*, which is leafless in the winter, opens its large pinkish white flowers in SPRING while the branches are still bare. *Mahonia nepalensis* is in full bloom in January, and its thick vertical racemes of yellow flowers emit a scent resembling that of Lilies-of-the-Valley. The smaller Rhododendrons are grown in the side beds.

Some very beautiful climbers are to be seen in this House, trained upon the roof supports or climbing up the walls.

Passing on into the North Octagon, a large collection of tender and rare species of conifers will be seen, many of which come from the southern hemisphere. It is instructive to note the great range in the shape of the leaf in these interesting plants—from the needle-shaped leaf of *Pinus* to the flat elliptic or oval leaves of *Podocarpus* and *Agathis* or the scale-like leaves of many genera, particularly the Cypresses.

To the west of the North Octagon is the Rhododendron annexe. Here are to be found a fine collection of Chinese Rhododendrons which cannot be grown out of doors at Kew. On the southern wall and a portion of the roof is trained a magnificent Chilean creeper, *Lapageria rosea*, which belongs to the Lily family. It opens its splendid pink flowers in the SUMMER.

From the North Octagon one passes into the Winter Garden or central section. In this building, of which the apex of the roof is 60 feet above the level of the ground, trees of considerable size can be grown, and a glance will show that full advantage has been taken of this opportunity.

This House is divided into four equal plots by broad paths running north and south, and east and west. The staging at the walls is occupied by pot plants of species which often grow into trees in their native homes, but in order that as many species as possible may be represented for scientific study, such plants can only be maintained in the small state. The pot plants on the staging are grouped as far as possible according to country of origin. On the south and south-west, for example, the plants are mainly South African. To the east and north-east the species come mainly from the Mediterranean region and the Canaries. To the north-west plants from temperate America are to be seen while to the west species from New Zealand are displayed.

Immediately on entering, attention will be drawn to the Tree Ferns in the first two plots. These species come mainly from New Zealand and Australia, and are particularly attractive in the spring when they are sending up their crozier-like young fronds.

The largest tree in the House is a specimen of the Chilean Honey Palm, *Jubaea chilensis*, which will be found on the right hand side, near the intersection of the paths. In its native home near Valparaiso it forms groves, and is tapped for its honey-like juice. It was originally planted 25 feet to the west of its present position, but when it reached a height of 45 feet the gallery impeded further growth. In 1938 it was decided to move the palm towards the centre of the House. This was successfully accomplished by enclosing the roots and surrounding soil in a casing and moving the tree and casing inch by inch on steel rollers to its present position. The total weight of the tree was about 3½ tons and it has now some 15 feet of head room.

Other large trees are *Araucaria cunninghamii*, the Moreton Bay Pine, and *A. bidwillii*, the Bunya-Bunya, an important forest tree from Queensland, both of which have had to be topped on several occasions. Other species of *Araucaria*, *A. angustifolia* (*A. brasiliana*) from South America and *A. excelsa*, the Norfolk Island Pine, are also to be found here. Visitors whose knowledge of *Araucaria* is limited to the Monkey Puzzle, *A. araucana*, will be surprised to see what graceful habits and foliage the other species possess. The species of this genus have a strange discontinuous distribution, Chile, Brazil, Australia, Norfolk Island and New Caledonia, and they are the stragglers of a very rich and ancient flora which was widespread in Jurassic times.

An allied conifer is the Kauri Pine, *Agathis australis*, from New Zealand, where it is considered to be a very important forest tree. Resin (copal) is obtained from all parts of the tree. On the sites of ancient Kauri forests this resin, known as Kauri Gum, is found in a fossilised state, and as much as 15,000 tons have been recovered in a year. The Gum is largely used in the manufacture of turpentine, varnishes and linoleum.

The Palms are well represented in this House, for besides the Chilean Honey Palm, there are numerous others from various parts of the world, many of which flower and fruit freely. *Trachycarpus fortunei*, the Chusan Palm, which is represented by a specimen 25 feet in height, is the one truly hardy palm in Britain, though it does not reach these dimensions in the open air. *Howea belmoreana* from Lord Howe Island, to the east of Australia, flowers freely, and the bright red fruits can be seen at most times during the year.

There are many species and hybrids of *Camellia* to be seen in this House, the most interesting of which is the Chinese *C. reticulata*, now nearly 100 years old, which will be found in the south-west plot usually in full bloom about February. This is the type of a species which had been cultivated for centuries by the Chinese before being introduced into this country. Many of our most beautiful flowering shrubs belong to this far eastern genus, which also contains the tea bush, *C. sinensis*, a specimen of which is also to be seen here.

The *Acacia* best known to the public is *A. dealbata*, the Silver Wattle, sold in the London market as 'Mimosa', but perhaps the most attractive here is *Acacia verticillata*. The leaves of Acacias are normally doubly pinnate, but in a large number of species these disappear after the seedling stage and the functions of the leaves are assumed by the leaf-stalks and often the stems, which remain green and are expanded in various ways. These 'phyllodes' are often remarkably like true leaves and of considerable size. The bark of many Acacias contains valuable tanning materials and several of them are cultivated in other countries for this purpose. A small Himalayan tree of great beauty, *Luculia gratissima* (*Rubiaceae*) which produces its sweetly scented pale pink flowers in late WINTER, is also to be found in the south-west plot.

Many fine climbing plants will be seen on the pillars and walls, some of them with striking flowers. *Semele androgyna* of the Lily family, from the Canaries, climbs over the spiral staircase in the south-east plot to the Gallery. This plant is allied to the Butcher's Broom, for the apparent leaves are in reality flattened branches which bear the flowers on their margins.

From the roof hang baskets in which interesting plants are displayed. The most remarkable of these is *Begonia haageana*, from the tropical forests of Brazil.

Passing into the South Octagon, many Australian and New Zealand trees and shrubs will be seen with others from various parts of the world. Several small specimens of *Jacaranda mimosifolia* are grown in pots here. The flowers of this South American tree are bluish or bluish-mauve in colour, one of the rarest flower colours in trees, and makes the tree a very popular one for avenues in Australia and in other warm countries where it has been introduced. A number of palms and Yuccas from Mexico and Guatemala will also be seen. *Callistemon* species from Australia bear their flowers in the axils of leaves of the young shoots. The stamens, deep red in colour, project at right angles to the shoot and the tree is aptly named the Bottle-brush. *Tibouchina semidecandra*, from Brazil, remarkable for its large flowers of a most gorgeous clear violet colour, is also to be found in this House.

The southernmost section of the Temperate House is still called the Mexican House, though it is not now devoted to Mexican plants. The general plan is that of the Winter Garden, namely, four rectangular beds, separated from one another and from the narrow beds round the walls by paths.

Perhaps the most interesting of the trees in this House is *Dracaena draco*, the Dragon Tree, a palm-like tree belonging to the lily family, which will be found on the right hand side, close to the central path. This tree owes its trivial name to the fact that exudations of a resin-like substance from the bark were known commercially as 'dragons-blood'. The substance was, and still is, used as an ingredient in varnishes, especially to give a reddish tinge to the finished product. The specimen of this species in the Temperate House was grown from a branch of a very famous *Dracaena* which grew at Teneriffe and was destroyed in a hurricane in 1867. The stem of the parent tree had reached a diameter of 16 feet, which must have placed it in the category of the world's oldest trees.

One of the largest trees is *Kigelia moosa*, the Sausage Tree, from East Tropical Africa. Several species of *Grevillea* (*Proteaceae*), an Australian genus, can also be seen here. They are remarkable for the diversity of their foliage, some having narrow lance-shaped leaves, while that of others is large and fern-like.

When the Javanese Rhododendron hybrids, grown in pots, flower they are placed here. The delicate tints of the flowers of these Rhododendrons, at their best in WINTER, are most attractive. It will be noticed that the corolla is quite different in shape from that in the Indian species of the genus, being longer and more tubular.

Another interesting genus is *Strelitzia* which is represented in this House by four species. The genus is closely related to the bananas, as will be readily recognised from the similarity of the leaves. The remarkable brightly coloured flowers of this genus are, in their native home, South Africa, pollinated by birds.

The pillars and walls are covered by climbing plants, mostly Australian.

The beds surrounding the outside of the Temperate House at the foot of the walls, are filled with plants which are mostly hardy but do better in sheltered situations. To the north-east and to a lesser extent in the south-west, are New Zealand species of *Veronica* (*Hebe*). To those who are only familiar with the herbaceous species of *Veronica* which grow in Europe, the New Zealand species, which grow into robust shrubs, will be of interest. Near the southern porch is the pomegranate *Punica granatum*, which ripens its fruit in this sheltered position in hot summers. On the west side is a fine plant of *Cytisus battandieri*, from the Atlas mountains. It produces a wealth of fragrant golden-yellow flowers in June.

AUSTRALIAN HOUSE

This House, which is rather more than ninety feet long and fifty feet wide, with a height of thirty feet, is of aluminium alloy and represents a new type of glass-house construction to provide the minimum amount of shading. The House is intended primarily for the culture of plants from the low rainfall and more arid areas of Australia.

Here are examples of the *Proteaceae* of which several genera confined as wild plants to Australia, are represented. Such are various species of *Hakea*, *Grevillea*, *Banksia*, *Isopogon* and *Dryandra* mostly from the west, whilst a fine specimen of *Stenocarpus* in the central bed is a representative of this family from Queensland. Almost all are characterised by very rigid foliage that is very resistant to desiccation. The tubular flowers have four segments, to the tips of which the anthers are usually attached.

Australia is particularly the home of the Wattles (*Acacia*) of which some five hundred species are known, and these exhibit two kinds of foliage; some such as *Acacia dealbata* have feathery compound leaves, in others such as *Acacia verticillata* the foliage is simple and in reality consists of green leaf-stalks (Phyllodes) often enlarged and flattened.

Another important Australian family is the *Myrtaceae*, which includes the Bottle-brush (*Callistemon*) growing in the central bed, conspicuous by reason of its scarlet stamens. Here, too, are other genera of the same family such as *Eugenia*, *Leptospermum*, and the attractive *Calothamnus* with the flowers on one side of the stem only. But the outstanding representatives of the *Myrtaceae* in Australia are the Eucalypts of which some 500 species are known; they include the giant Blue gums, but only the smaller mallee types can be grown satisfactorily here.

Another characteristic tree is the Australian She Oak (*Casuarina*) with only rudimentary leaves, the green twigs serving for the manufacture of food.

The *Rutaceae* has many characteristic Australian representatives and the beautiful pink *Crowea*, on the south side of the central bed, is one of the most showy, whilst on the north side *Boronia megastigma* has brownish strongly scented flowers.

The Pea tribe (*Leguminosae*) is a world-wide group of large size but the endemic Australian representatives are often very spectacular. Such as, for example, the red-flowered *Kennedya* that can be seen spreading over the ground or the similarly prostrate Desert Pea (*Clianthus*) with its silvery foliage and large scarlet and black blossoms, which can usually be seen here during the SUMMER.

Angraecum sesquipedale

Routes

ROUTE A

Main Gate—Turkey Oak—Ash Collection—Holly Walk—Southern Path—Pagoda—Palm House or Cedar Vista or Acacia Vista.

AFTER entering the Main Gate, turn to the left and follow the path towards the greenhouses. The first object that will catch the eye is a fine specimen of the Corsican Pine (*Pinus nigra* var. *calabrica*) standing on a narrow strip of grass on the left between a low rail and a background of evergreen shrubs and small trees. Just opposite on the other side of the path is a *Zelkova carpinifolia*, a Caucasian tree allied to the Elms, with Beech-like bark and delicate twiggy branches. Nearby is the Service Tree, *Sorbus domestica*, a close ally of the Mountain Ash, and farther on at the intersection of the paths are two specimens of the Swamp Cypress, *Taxodium distichum*, a tree native to the marshes bordering the Mississippi River, and one of the few coniferous species that shed their foliage in winter.

In SPRING the narrow lawn on the left is ablaze with Daffodils and Narcissi, and near the end is a fine bush of the American *Nuttallia*, and one of the Persian *Parrotia*, an ally of the nearby Witch Hazels. At the same season there will be seen a carpet of the yellow-flowered Winter Aconite (*Eranthis hyemalis*), beneath the Lilac hybrids in the circular bed to the right of the path. The Lilac itself comes into flower in late SPRING.

In SUMMER the shrubs and small trees on the right of the path are in flower and visitors should not miss *Magnolia soulangeana*, which opens its large fragrant flowers early on, and the *Philadelphus* hybrids, which, with their pure white flowers and golden stamens, delight the eye and scent the air in June.

In AUTUMN the tints of *Parrotia* and *Sorbus domestica* are a beautiful feature, whilst the red berries of *Stranvaesia* and the species of *Berberis* (especially *B. thunbergii*) are worthy of attention.

Crossing over the intersection of paths there are two shrubs on the left of the path which must not be missed in the SPRING time. The first is *Hamamelis mollis*, the Chinese Witch Hazel, which bears on the bare branches brilliant yellow fragrant flowers, the petals of which uncoil as they open. In mild winters this bush will flower as early as December. The other is *Corylopsis sinensis*, which likewise is leafless in the SPRING, when the branches are covered with tassels of yellow flowers. Between the two are a Yew, the Umbrella Pine, *Sciadopitys verticillata*, a conifer from Japan, of special interest because of its twin leaves, each of which is the equivalent of two conifer needles joined together, and the Giant Heath, *Erica arborea*, from the roots of which briar pipes are made.

On the other side of the path are a number of interesting trees. A group of fine cedars (*Cedrus libani*) will catch the eye. They are the survivors of a violent storm in March 1916, during which one of them (presented to Kew by the Duke of Argyll in 1762) was blown down and fell upon, and demolished, the Temple of the Sun, one of the creations of Sir William Chambers. On the actual site of the temple is a young Maidenhair Tree planted by Her Majesty Queen Mary in 1923. Close by is a very ancient Locust Tree, *Robinia pseudo-acacia*, one of the oldest trees in the Gardens, having been planted about 1761. A little further to the right is an ancient Turkey Oak, *Quercus cerris*, planted about the same time.

The fine old Maidenhair Tree (*Ginkgo biloba*), now 80 feet tall, is the most conspicuous feature here. It has been called a living fossil, for it is a member of a group which can be traced back to Jurassic times; it is not closely related to any other living group. This particular specimen is a male tree, but some female twigs, obtained from Montpellier in France, and grafted on to it, first bore fruit in 1919. The tree was planted about 1762.

Just beyond the Ginkgo, and still to the right, is an iron cage upon which an old Wistaria is trained; this is one of the woody climbers (*lianes*) of the Pea Family. The Wistaria was once trained over the 'Great Stove' built for Princess Augusta in 1761—it was pulled down a hundred years later. Nearby is a White Poplar, known as Bolle's Poplar, with ascending branches and the habit of the Lombardy Poplar. A good specimen of Liquidambar, *L. styraciflua*, grows beside it. The leaves of this tree, a native of the United States, contain a perfumed resin and assume the most gorgeous tints in AUTUMN. Close by will be found a specimen of the Glastonbury Thorn, a variety of the common May or Hawthorn. This tree is, according to legend, a lineal descendant of the tree which sprang from the staff

Temperate House Interior

of Joseph of Arimathaea. The tree flowers usually very close to Christmas Day or New Year's Day, a circumstance which is taken by the credulous as proof of the truth of the legend. Actually the time of flowering is not constant, but varies within narrow limits according to the season. A little beyond this point, and still to the right, is an elliptical bed in which are planted a number of trees and shrubs remarkable for their reddish-brown, coppery or variegated foliage. In early SPRING the copper-leaved Cherry Plum, *Prunus cerasifera*, is covered with white blossom.

On the lawn to the left are a number of trees and shrubs. Turner's Oak, *Quercus* × *turneri*, will be noticed at once at any time of the year because of its fine foliage—it is thought to be a hybrid between the Evergreen Oak, *Q. ilex*, and one of the English Oaks, *Q. robur* (*Q. sessiliflora*).

In SPRING the bed of *Magnolia stellata*, a Japanese species, will be in full flower while the branches are still bare. The flowers are white or tinged with pink, exquisitely fragrant, and like all Magnolias have the parts of the flower in a spiral. The Grape Hyacinth, *Muscari comosum*, is also planted in this bed and produces its blue flowers at the same time. *Catalpa speciosa*, an American tree with white flowers spotted with yellow and purple, comes into blossom at the end of SPRING and produces pods about eight inches long later in the year.

In SUMMER we see here *Magnolia sprengeri* covered with white flowers, and two Buckeyes, *Aesculus californica* and *A. pavia*; the former with white, the latter with red flowers, are a pleasing sight, and are American relatives of the European Horse Chestnut.

The Weeping Elm, *Ulmus glabra* var. *pendula*, is at its best in WINTER when the fall of the leaf exposes its intricate pendant branching. Towards the end of the lawn and on the left is a very old and decrepit *Sophora japonica*, one of five imported into this country from China in 1753 by one William Gordon of Mile End. This ancient tree can no longer support its own limbs which must be propped up, and cavities in the trunk have had to be filled with concrete to prevent the spread of decay.

Just before the path forks, a Japanese Cherry, *Prunus serrulata*, will be seen on the left, the single-flowered variety of which is one of the best of the flowering cherries and is a gorgeous sight in the SPRING.

The mound between the two paths is occupied by a fine specimen of the Turkey Oak (*Quercus cerris*). This tree is over 80 feet tall with a crown spread of over 110 feet. This Oak, a native of S. Europe and Asia Minor, was introduced into this country as long ago as 1735.

It is perfectly hardy, grows fast and is deservedly popular as an avenue tree. The timber, however, is much inferior to that of the native Oak.

Crossing over the Broad Walk and entering the path directly opposite, the eye will be caught by a group of conifers on the right, among which the most conspicuous are two specimens of *Cedrus*. One, the Deodar, *C. deodara*, from the western Himalaya, has pendulous branches, while the other, *C. atlantica*, from the Atlas mountains of North Africa, has an upright habit. Just behind these is a small group of cherries, *Prunus subhirtella* var. *autumnalis*, which come into flower in November, when the tree is still leafless. In front of the group and nearest to the path is a specimen of the Mountain Snowdrop Tree, *Halesia monticola* var. *mollis*, which is covered with snow-white flowers in early SUMMER and with curious four-winged fruits in WINTER.

Close by are a number of Lilac hybrids which are at their best in late SPRING. Just beyond the Lilacs on the left is a bed of the Judas Tree, *Cercis siliquastrum*, so called because tradition has it that this is the tree upon which the arch traitor hanged himself. In early SUMMER large masses of pink flowers are produced on the leafless branches. The pods hang for a considerable time on the branches, long after the leaves have fallen. Farther on, still on the left, is a bed of *Buddleia globosa*, a native of Chile, which produces racemes of globular heads of yellow flowers in May and June.

A little farther on is a Persian Willow, *Salix medemii*, which produces its fragrant inflorescences abundantly in January, when the branches are still leafless.

Proceed forward, beyond the first turning, noticing a specimen of the common larch, *Larix decidua*, on the left, with a fine oak, *Quercus lanuginosa*, a native of southern Europe. A little farther on, on the same side, is a specimen of the Bishop's Pine, *Pinus muricata*, from California. The cones of this pine remain upwards of 25 years on the branches.

Ignore the second turning on the left, only pausing to observe the Wig Tree, *Rhus cotinus*, at the corner. In late SUMMER the whole plant is covered with rose-coloured, threadlike, much branched panicles.

At the next crossing turn left and notice the bed of *Rhododendron azaleoides* at the corner on the right. The white, very fragrant flowers are produced in profusion in June and July.

On the right hand side is a depression which was originally a gravel pit, but which has since been artificially extended. On the slope near the path a collection of *Erica* shrubs has been planted. Farther on, the slopes contain many crocus bulbs which produce their white, yellow and mauve flowers in SPRING.

From this point to the next crossing, the path runs through a woodland of magnificent trees of oak, beech and ash, with occasionally sycamores and cedars singly or in small groups. On the right below the ash trees is an assemblage of *Forsythia* with Lilac and *Ligustrum* which flower throughout the SPRING. To the left just at the crossing is a bed of *Chionanthus retusa*, the Chinese Fringe Tree, which is covered with snow-white flowers in the SUMMER.

Continuing straight ahead, the path runs through the Ash collection until it crosses the grass vista, called Syon Vista. The Ashes are deciduous trees which can be recognised in the leafless state from their dull black buds.

Many species of Ash (*Fraxinus* spp.) produce a timber which enjoys a great reputation for toughness and durability. In the early days of aviation, before the metal wing came into use, aeroplane wings were sometimes made from it. The Common Ash (*Fraxinus excelsior*) is represented in many of its varieties, of which the Weeping Ash and the one-leaflet varieties are the most interesting. In the latter, the several pinnately arranged leaflets are reduced to one very large leaflet. Other interesting species are *F. ornus*, the Manna Ash, which differs from most of the other species by having white petals in the flowers. In May the flowers are produced in such numbers as to cover the whole tree. The sap of the tree yields manna sugar, a mild laxative.

F. spaethiana, from Japan, is remarkable for the very large swollen base of the petiole. Other species, such as the Blue Ash (*F. quadrangulata*), have markedly quadrangular branchlets. A North African species (*F. dimorpha*) is interesting because of its dwarf bushy habit and finely cut leaves.

From Syon Vista, the Palm House and the Rose Garden can be seen on the left, while on the right the vista, bordered on both sides by the evergreen Holm Oak, *Quercus ilex*, extends past the lake towards Syon House. On one side beyond the vista is a patch of species of Ash, and then isolated Beech trees through which the Lake can be seen. On the other side is a sprawling Yew and a semi-deciduous Oak, the Lucombe's Oak, *Quercus* × *lucombeana*, so called because a gardener named Lucombe raised seedlings of it from acorns found on the Turkey Oak, *Quercus cerris*. It is believed to be a hybrid between that species and the evergreen Cork Oak, *Quercus suber*, from the bark of which bottle-corks are made. Farther to the left is a small mound upon which are planted the beautiful flowering cherry, *Prunus sargentii*, bushes of species of *Lonicera*, *Dipelta*, and *Halesia*, all of them with attractive flowers in SPRING and early SUMMER.

Farther on at the point where five paths meet will be found on the left a bed planted with the Bird Cherry, *Prunus padus*, with white fragrant flowers, and several *Lonicera* shrubs, one of which, *L. purpusii*, flowers profusely in January. Still farther to the left is a thick mass of *Rhododendron obtusum*, a densely branched shrub covered with faintly scented, small, scarlet flowers in SPRING and early SUMMER.

Crossing over follow Holly Walk, so called from the fact that it is bordered by the collection of hollies, but of interest also because it follows almost exactly Love Lane, the ancient route and right of way from Richmond to Brentford Ferry, and which roughly marks the boundary between the two gardens that constitute the Royal Botanic Gardens of today. To the right of the walk is a magnificent piece of woodland of Oak, Beech and Sweet Chestnut, which must have been planted more than 200 years ago by Queen Caroline, the consort of George II. In SPRING wide stretches are covered with bluebells and daffodils.

At the north end of Holly Walk, that is, at the crossing, are several enormous beeches on the right, underplanted with Rhododendron and *Mahonia aquifolium*, the Oregon Grape, a small prickly shrub with small yellow flowers in early SUMMER, followed in AUTUMN and WINTER by quantities of purple berries covered with a waxy bloom. The leaflets are holly-like and turn a purplish colour in winter.

On the left is the collection of Nettle Trees, so called because they belong to the Nettle family but without the unpleasant characteristics of the common Nettle. A little farther on to the right is another bed of the Judas Tree. Opposite will be seen King William's Temple surrounded by its Rhododendrons and Heaths. The flagstaff can be seen behind the temple.

Just beyond on the left are two crescent shaped beds with an elliptical bed between them. The crescents are planted with various species of Rhododendron and the elliptical bed with species of Pepper Bush, *Clethra*, from the U.S.A. and China—shrubs which produce their racemes and panicles of snow-white flowers in late SUMMER and AUTUMN. On the other side of the path is an irregularly shaped bed with a number of small trees and shrubs underplanted with Foxgloves. Conspicuous amongst the small trees are the species of *Stuartia*, a genus belonging to the Tea family and natives of the eastern U.S.A., Japan and China. All of them have magnificent flowers, white with purple stamens and bluish anthers, borne singly on the branches, and produced in July and August. In late SUMMER *Eucryphia glutinosa*, a native of Chile, comes into flower. The whole tree is covered with rose-like flowers, which makes it an object of singular beauty.

Farther on to the left a path runs obliquely to the Temperate House. On either side of this path are to be seen two specimens of the only truly hardy Palm in Britain. This is the Chusan Palm, *Trachycarpus fortunei*, a native of E. Asia. The trunk is covered with a mass of fibres from which the Japanese weave a kind of coarse cloth. Continuing between the Holly trees one comes to a point where a path from the Temperate House crosses Holly Walk obliquely. From this point onwards to the end of Holly Walk the beds to right and left are devoted to the collection of wild roses.

Just beyond the point where the path crosses will be seen, one on each side of the path, two Redwood trees, *Sequoia sempervirens*, a species which grows in its own home in California to a height of over 300 feet with a diameter of from 20 to 28 feet. The Monterey Cypress, *Cupressus macrocarpa*, of which there are two trees on the right close at hand, is also a native of California.

Holly Walk is crossed farther on by Cedar Vista. A glance to the left shows the Pagoda framed in Cedars, and one to the right reveals the western end of the lake in the distance.

On the other side of Cedar Vista and on the left is a small mound upon which stands a replica of a famous Japanese Gateway—'The Gateway of the Imperial Messenger' or 'Chokushi Mon'—which was one of the exhibits at the Japanese Exhibition in London in 1910. It was presented to the Gardens by the Kyoto Exhibitors' Association. It stands on the site of the Mosque, a building erected by Sir William Chambers in 1761, but of which no trace now remains. On the mound, which is called Mossy Hill, are some very ancient Cedars, with Bhutan Pine, *Pinus wallichiana*, and Corsican Pine, *P. nigra* var. *calabrica*.

Just before the southern path is reached, a Yew Walk, leading to the Pagoda, will be crossed. These Yews are a distinct variety of the Common Yew, distinguished by its upright and compact habit and with the leaves spreading all round the shoot. The variety is called the Irish Yew because the two original trees (which were females) with this habit were first found in Ireland in 1780 and from one or the other all existing Irish Yews have descended, either by grafts or by cuttings. The fact that a male tree exists was not discovered until

1927. At the end of Holly Walk a fine view can be obtained of the Old Deer Park of Richmond, much of which was laid down to grass by George III for sheep-grazing, but now leased to the Royal Mid-Surrey Golf Club.

Turn to the left at the junction of the two paths and proceed eastwards. The path is lined on the right by evergreen trees and shrubs among which are Yew, Holly, Holm Oak, with small bushes of Rhododendron, etc.

The few old Cedars and Scots pine growing near the Pagoda are the remnants of a large number planted about the time of its erection in 1761.

It is well to pause on the north side of the Pagoda to get one's bearings. Due north, at the end of the vista, can be seen the Palm House and Rose Garden. Half right is a vista leading down to the Refreshment Pavilion. Half left, i.e., due N.W., the vista known as Cedar Vista leads to the western end of the lake. To the right is the Heath Garden.

In the neighbourhood of the Pagoda are to be found many interesting trees and shrubs. In WINTER, *Prunus subhirtella* will be found in full flower, while the branches are still bare. To the west are a couple of specimens of the Handkerchief Tree, *Davidia vilmoriniana*, a characteristic of the flowers of which is that the head is surrounded by large white bracts. In SUMMER the most striking of the small trees is *Eucryphia glutinosa*, from Chile.

To the south is a bed in which are grown, under the shade of three cedars, a *Stuartia*, *S. sinensis*, with a pale brown bark which peels off in strips, and bushes of small Rhododendron, Styrax and other species. This bed is underplanted with *Ruscus hypoglossum*, *Mahonia aquifolium*, Heaths and Foxglove. From June to September the late flowering heaths in the bed are a pretty sight. The genus *Ruscus* is interesting to botanists because what appear to be the leaves of the plant are actually flattened branches which perform the functions of leaves—the true leaves are small green scales on the mid-ribs of the false leaves.

From here the visitor can take three walks:

1. Pagoda Vista to the north.
2. Cedar Vista to the north-west.
3. Acacia Vista to the north-east.

1. *Pagoda Vista*

On both sides the vista is bordered with different species of trees, all of which except two are deciduous. These trees are symmetrically arranged and equally spaced, so that every species is duplicated in

Daffodils in April

its opposite number. Behind these trees is another line in which Cedars are conspicuous.

The evergreen species are several Holm Oaks, *Quercus ilex*, near the Temperate House, and Turner's Oak, *Q.* × *turneri*, near the Heath Garden. The deciduous species are of many genera, no two species in one line being alike. Each is worthy of attention either for its foliage or for its economic value, or both, and much interesting information will be found on the labels affixed to the boles.

2. *Cedar Vista*

From the Pagoda two paths diverge, one northwards towards the Palm House, and the other in a north-westerly direction passes to the western end of the Lake and is called Cedar Vista, from the fact that when it was laid out in 1871, in Sir Joseph Hooker's time, it was lined on both sides with Atlantic Cedars (*Cedrus atlantica*). Although only 86 years have passed since the Cedars were planted, only a very small proportion of them remains.

Leaving the Pagoda, the bed on the left will be observed to be planted with species of quince (*Chaenomeles*) and *Rhododendron racemosum*, a native of West China, under the shade of an Umbrella Pine (*Sciadopitys verticillata*), the Southern Beech (*Nothofagus obliquus*), and Scotch Pine (*Pinus sylvestris*). On the opposite side of the vista is part of the collection of Brambles and Raspberries (*Rubus*), some of those in the bed having curious white stems, looking as if they had been white-washed.

Continuing in the direction of the Lake, one passes Chokushi Mon, the Gateway of the Imperial Messenger (see page 7), situated on top of Mossy Mound, the former site of the Mosque built by Sir William Chambers. A fine bed of *Hydrangea paniculata* is to be found at the foot of this mound.

Crossing over the Holly Walk, which is here bordered on the east side by the collection of roses and on the left by the *Philadelphus* collection, continue up to the next path, namely, one running from the Oxenhouse Gate to the Rick Yard. This Gate opens out of the Gardens on to the Royal Mid-Surrey Golf Course, but is not used by the public.

From here onwards the Cedar Vista runs through magnificent woodland, some of which was planted by Queen Caroline, consort of George II, over 200 years ago. In SPRING the forest floor under the shade of stately oak and beech trees is covered with Narcissus and later on by Bluebells. In the AUTUMN the trees take on the most gorgeous rosy and orange tints.

A little farther on another path is crossed. This runs from the collection of Larches into the Rick Yard. Crossing over this the vista is flanked by woodland with occasional beds of Rhododendron on both sides. About 60 yards farther on one comes to a point which is the intersection of three grassy rides. Cedar Vista proceeds in a north-westerly direction. An east and west ride runs from the fence around Queen's Cottage grounds, due east to a point a little south of the Refreshment Pavilion. Another ride at right angles to the last runs north from the southern boundary and comes out on the lake near its eastern end. A little farther on and a path is met which comes from the collection of Yews and runs into the Rick Yard. Just beyond this is the Lily Pond (see page 29).

To the right is the holly hedge surrounding the Arboretum nursery and outside it is the collection of the varieties of *Pinus nigra*, including the Corsican and Austrian Pines.

Crossing over Route B (see page 76) and skirting the western end of the Lake one passes two small mounds upon which are planted *Libocedrus decurrens*, *Pinus montana*, and *Liquidambar styraciflua*. *Libocedrus decurrens* is the Incense Cedar, a native of California, and is remarkable for its shape which resembles closely that of the Lombardy poplar.

On the farther side of Syon Vista one reaches Mount Pleasant on the right and the beginning of the Oak collection on the left.

3. *Acacia Vista*

The vista running north-east from the Pagoda to the Tea Pavilion is bordered on both sides with trees and shrubs belonging to the Sweet Pea family. At the Pagoda end the trees are mainly *Robinia pseudo-acacia*, commonly called 'False Acacia', or less often 'Locust'. This tree is a native of the eastern United States and a considerable number of its varieties are planted in or about this vista. Near the Tea Pavilion the species planted is *Gleditsia triacanthos*, the 'Honey Locust', a tree somewhat similar in foliage to the False Acacia but different from it in the bark and in the curious branched spines which grow upon the bark.

On the right hand side is a bed in which is planted the Spanish Broom, a native, as its name implies, of southern Europe. There are practically no leaves and their function is performed by the dark green, rush-like stem and branches. The large golden-yellow flowers are produced in late SUMMER and are very showy. A fibre can be obtained by maceration from the stems and branches, and this is used in its native home for making thread, cordage or even a kind of coarse fabric.

Crocuses in March

ROUTE B

Victoria Gate—Boathouse Walk—Mount Pleasant—Oaks—Elms—Birches—Poplars—Orangery

On entering Victoria Gate the Palm House can be seen half right. Turn to the left and then again to the right. At this point the Temple of Bellona can be seen on a small mound on the left. This is one of the creations of Sir William Chambers, the architect employed by the Princess Augusta, widow of Frederick, Prince of Wales, to embellish the property of Kew House, and was built in 1761. Immediately on the right is a bed filled with various species of *Amelanchier*, a genus of small trees and shrubs found in the northern hemisphere, allied to the Medlars. In SPRING the branches are covered with snow-white flowers, while in AUTUMN the foliage takes on the most attractive tints.

Follow the path towards the Clematis garden, which occupies a bank on the left. On the lawn to the right are various species of conifers; both pines and cedars are conspicuous, underplanted with the earliest of the flowering cherries, *Prunus yedoensis*. A large common larch, *Larix decidua*, grows on the lawn to the left. A little farther on, on the left, the species of *Clematis* are seen at their best tumbling over the artificial wall. Noteworthy amongst the *Clematis* species are the climbing purple *C.* × *jackmanii*, the yellow-flowered *C. tangutica,* with blooms like miniature chinese lanterns, and the shrubby *Clematis alpina* and *C. recta*. Beyond the *Clematis* on the left is the collection of Sun Roses (*Cistus*), which are such a feature of the Mediterranean garigue, and their allies the Rock Roses, *Helianthemum*: this bed is a blaze of colour in SPRING and SUMMER. Close to this, but a little farther on, is another bed in which the colour is provided by species of *Hibiscus*, a tropical genus, of which only a few species are hardy in this climate. With the *Hibiscus* are some small trees of the eastern asiatic genus, *Acanthopanax*, a close relation of our common ivy.

Crossing Pagoda Vista, King William's Temple will be seen on the left. Between it and the path is a large bed in which the majority of the bushes are the Witch Hazel, *Hamamelis mollis*, and *Corylopsis himalayana*. The former flowers sometimes as early as December in mild winters. Its flowers are bright yellow and delightfully fragrant, while the strap-shaped petals which uncoil as the flowers open, are most curious and attractive. The latter is a striking sight in SPRING when the bare branches are covered with tassels of yellow flowers.

The bed is underplanted with species of *Muscari* and *Anemone appenina*, herbs which open their blue flowers in April.

Immediately beyond the next path is the collection of Mulberries which contains, besides several species of Mulberry, the Paper Mulberry, *Broussonetia papyrifera*, from the bark of which both paper and cloth can be made. The small Mulberry, *Morus nigra*, is a lineal descendant of Shakespeare's Mulberry at Stratford-on-Avon. On the right, grouped round the fountain, is the collection of Honeysuckles, *Lonicera*, which includes climbers like our native species, and bushy shrubs like the fragrant *L. syringantha*. The path then passes through the collection of Nettle trees to Holly Walk.

Just before the Holly Walk (see Route A) is crossed, there is a bed of the beautiful Heath genus *Enkianthus* on the left, and one of *Rhododendron obtusum* on the right. At the crossing a pleasant view of the lake can be obtained through the open beech woodland.

Crossing over, follow the path which skirts the left bank of the lake. This path is known as Boathouse Walk, and leads directly to the Isleworth Gate. The path passes through part of the collection of conifers, and interesting species of pine, spruce, hemlock and fir may be seen on both sides. The species are so arranged that the New World species are planted on the right hand side of the path and the Old World species on the left.

Just before the end of the lake is reached the bed of *Ephedra* species on the left must not be missed. These wiry shrubs, which resemble in appearance the Horsetails, but belong to an isolated group—the *Gnetales*—inhabit dry and inhospitable regions of the earth. Some of the species are economically valuable on account of the presence of the drug, ephedrin, in the tissues. This drug, which is a very powerful astringent, enters into the composition of a number of popular 'cures' for the common cold. With them are several species of Juniper, both shrubs and small trees, the berries of which are used to give gin its flavour. Between the *Ephedra* and the Junipers is a grassy walk which leads to King William's Temple.

Turn to the right just at the Isleworth Gate. A few yards bring one to a point from which the Palm House can be seen on the right at the end of the Syon Vista, while Syon House itself, a residence of the Duke of Northumberland, can be seen to the left on the farther bank of the Thames.

On the right is a mound called 'Mount Pleasant', which is planted with double-flowered gorse, lavender, rosemary and various species of broom (*Cytisus*). When the gorse is in bloom in SPRING the mound is a brilliant mass of colour.

Follow the path which runs roughly northwards to the Brentford Gate. The western boundary of the Gardens along the Thames towpath is planted with a thick border of evergreen trees and shrubs which effectively screens the farther bank of the Thames. The collection of oaks (*Quercus*) will be found mainly in the space between the path and the western boundary, and the visitor will find much here to interest him. All the species in cultivation known to be hardy are to be found here. The genus is a very large one consisting of about 250–300 species inhabiting the temperate and warm temperate regions of the northern hemisphere—a few are found in the plains in the tropics. About one quarter of these can be grown in the British Isles. The two common oaks of this country, *Quercus robur* (*Q. pedunculata*) and *Q. petraea* (*Q. sessiliflora*), are represented not only in their typical forms but also in the varietal forms, of which the var. *fastigiata* with ascending branches like a Lombardy poplar is the most remarkable. There are also varieties with curiously cut leaves. The American Red Oaks, of which *Q. coccinea* is the most conspicuous, are a fine sight in the AUTUMN when the leaves turn a bright scarlet. *Q. alnifolia* is also seen here—it is known as the Golden Oak of Cyprus and its leaves are tawny yellow beneath when young. Another interesting oak is *Q. pontica*, a very rare oak from the Caucasus, with large strongly ribbed, toothed leaves. *Q. coccifera*, the Kermes Oak or 'Grain Tree', an evergreen bush of peculiar interest, is the plant upon which the Kermes insect (*Chermes ilicis*) feeds. The bodies of the insects yield a brilliant scarlet dye, once much used, and then known as 'scarlet grain'. This dye was of such importance that three sprigs of this tree form the crest of the Dyers' Company of London. There is a fine specimen of the tan bark oak of North America, *Q. densiflora*, of which the leaves are milk-white below in the SPRING. The Holm Oak, *Quercus ilex*, does particularly well upon the dry soil of Kew, and there is a great deal of it in the Gardens. *Quercus phillyraeoides* is of interest, if only for the fact that it does not look like an oak at all, and were it not for the alternate leaves and occasional acorns might easily be mistaken for the Mediterranean bush, *Phillyrea*, from which it takes its specific name. The common cork of everyday use is made from the bark of an oak, *Quercus suber*, which is also represented in the collection. The tree is at home in the mountains surrounding the Mediterranean Sea, especially the western end. The bark for the manufacture of cork is stripped from the trunk and larger branches every eight or ten years.

On the right of the path will be found a mass of Rhododendrons

Bluebells in Queen's Cottage Grounds, May surrounding the Rhododendron Dell (see page 15), to which a path leads off to the right. Farther on two magnificent beeches will be seen, one on each side of the path at the top of a small rise. Just about here the oak collection on the left ends and the collection of elms begins. A little farther on another path (Stafford Walk, see page 15) leads at right angles into the Rhododendron Dell and at the corner is a specimen of *Juniperus virginiana*, the Red Cedar of North America.

As with the oaks, the elms show much variation in their foliage and habit. The most interesting, as well as the commonest of the Elms, is *Ulmus procera*, a tree which is well known in the south of England. The origin of the tree is veiled in mystery since it is not capable of producing fertile seed, and all the trees that line the hedgerows in southern England are derived from rootsuckers. It is certain that it occurs wild in England only, and nowhere else except those places into which it has been introduced from England. It may be an infertile hybrid or it may have lost the power of producing fertile seed as sometimes happens with trees which produce suckers as readily as this one does. Many other Elms, including two of our common Elms, *U. carpinifolia* and *U. glabra*,, as well as weeping varieties, will be found in this collection.

Near the Brentford Ferry Gate will be found several interesting genera closely allied to the Elms; *Planera* (North America), *Aphananthe* (Japan), and *Zelkova* (Caucasia, China and Japan). The species of the latter genus grow into fine umbrageous trees.

The austerity of the woodland is relieved here and there with beds of *Forsythia*, *Magnolia stellata*, *Prunus* and *Berberis*, which are covered with blossom in SPRING and early SUMMER. Beds of *Philadelphus* hybrids produce their beautiful white fragrant flowers in SUMMER.

The Rhododendrons to the right soon thin out and the path proceeds through woodland, with Elms on both sides of the path, until a fork is reached. The path to the left leads to the Brentford Gate; the path to the right leads to the Orangery, and eventually to the Main Gate. On the left at the fork is an immense cedar, remarkable for its horizontal, slightly pendulous, branches. The triangle between the paths contains the remainder of the Elm collection, with beds of *Erica arborea*, *Cistus cyprius*, with beautiful white flowers in early SUMMER, each petal of which has a blood-red blotch near the base, and *Cotoneaster salicifolia*, whose white flowers in early SUMMER and red fruits in WINTER are equally attractive.

Following the right hand path the collection of birches will be seen on the left and the collection of poplars on the right.

The Birches are easily recognised by their white or silvery trunks and elegant branching. These trees are not long-lived, nor is their timber very durable, but they are of great use to mankind in that they grow and provide fuel in some of the coldest and most inhospitable places in the northern hemisphere. The Paper Birch, *Betula papyrifera*, so-called from the brilliant white colour of the bark and the fact that it peels off like sheets of paper, is one of the most widely spread and most useful of the North American birches. Apart from its use as fuel, the bark is used for roofing and for canoes, for the bark is actually more durable than the wood which it covers. In this collection are to be found many varieties of our common White Birch, *Betula alba*, of which the weeping variety (var. *pendula*) is particularly graceful.

The poplars are allied to the willows and some of the species are remarkable for their rapid growth and graceful habit.

One of our English trees, Aspen, *Populus tremula*, is a small tree with greyish-green leaves which exhibit a constant quivering motion. 'To quiver like an aspen leaf' is a phrase which goes back to Spencer's time, perhaps long before. This motion in the slightest breeze is due to the slenderness and flattened form of the petiole. It does not produce fertile seed, but spreads by shoots that develop from the roots, often many yards from the parent tree. The Balsam Poplars are so-called because their buds and young leaves give out a strong balsamic odour in SPRING. One of the most beautiful of the poplars is the Chinese *P. lasiocarpa*, which bears leaves up to 13 inches long by 9 inches wide, with a rich red mid-rib.

At the cross roads at the end of the Poplar and Birch collections the path touches Route A. Turn to the left past the low mound on which lilac hybrids have been planted. The beds nearby contain flowering shrubs with a strip of Michaelmas Daisies on the north side.

Straight ahead will be seen the Orangery and behind it is the Main Gate. Half left will be seen Dutch House (page 12).

The broad lawn on the right is known as Seven Sisters' Lawn, so called from a group of seven ancient elms which once stood upon it. Unhappily they have all succumbed to the dreaded Elm Disease.

ROUTE C

Lion Gate—Ruined Arch—Flagstaff—Magnolias—Pond—Cumberland Gate—Cambridge Cottage—Orangery.

Enter by the Lion Gate. A few steps bring one to a Japanese cherry, *Prunus serrulata*, which is covered with magnificent rose-coloured blossom in SPRING.

Take the first turning to the right. In SPRING *Magnolia soulangeana* on the left will be opening its white flowers, tinged with pink, while on the other side of the path *Prunus lannesiana* will be covered with its faintly scented rose-coloured flowers at the same time. Close by is a specimen of *Malus* × *eleyi*, a hybrid crab, which is covered with wine-red flowers in April and May, and these are succeeded by fruits of a rich purplish red, which hang from the branches well into late AUTUMN. Just opposite is a specimen of the Giant Heath, *Erica arborea*, from the roots of which briar pipes are made. A little farther on the Heath Garden will be seen on the left.

A collection of Walnuts (*Juglans*) and the Hickories (*Carya*), which belong to the same family, are to be found here on both sides of the path a little farther on. A good many of the species of these deciduous trees produce edible nuts in their native countries, but here they are mainly grown for their ornamental value. On the right of the path, and between it and the wall bordering the garden, are groups of evergreen shrubs and trees, such as Hollies, Box, Yews and others.

In June a bed of the Chinese *Sophora viciifolia* on the left is worthy of note, as the blue and white racemes are produced in profusion in that month, their beauty being greatly enhanced by the elegant fern-like foliage. From this point to the path leading to the Refreshment Pavilion, there are several beds with Spanish Gorse, *Genista hispanica*, and other species of *Genista* and *Cytisus*. Both these genera belong to the Sweet Pea family and the flowers are almost always yellow. Behind these beds can be seen trees with curious branched spines on the stems. They belong to the genus *Gleditsia*, a member of the Sweet Pea family, commonly known as the 'Honey Locust', all the species of which are armed with the formidable spines already mentioned.

The False Acacia, *Robinia pseudo-acacia*, is also common on the lawns to the left.

Just beyond the path to the Refreshment Pavilion is a very fine old Holm Oak, *Quercus ilex*, below which is planted the pretty shrub *Gaultheria shallon*, a native of North America. Further on to the left is a bed of the interesting Etna Broom, *Genista aetnensis*, which grows upon the slopes of Etna in Sicily. This shrub flowers in July and early August and produces masses of yellow flowers along the bright green rush-like branches. On the opposite side of the path will be found the curious shrub *Paliurus spina-christi*, called 'Christ's Thorn', traditionally the shrub from which the Crown of Thorns was made. The thorns are at the nodes and point in opposite directions.

From this point the Ruined Arch can be seen, and directly over the centre arch the Flagstaff, some 90 or 100 yards behind, rears its 214 feet* of height above the Gardens. The Ruined Arch, built in 1760, was one of the creations of Sir William Chambers (see page 7), who designed it to imitate a Roman antiquity, but it formerly had a utilitarian purpose, namely, to carry a carriage way into the Gardens from the neighbouring Kew Road.

On the left before the Arch is reached is a large bed planted with species of *Rhus*, the Sumachs. It is perhaps well to warn visitors that the species of *Rhus*, although often cultivated in gardens for the sake of the handsomely divided foliage which becomes brilliantly coloured in AUTUMN, contains a sap which may in some species give rise to eczema-like sores or painful blisters. The most dangerous of them all, *R. toxicodendron*, a native of North America, and is to be avoided like the plague.

In the bed will be found *R. verniciflua*, the sap of which nourishes the lac insects that produce the famous lacquer of Eastern lands. Another interesting species of the same genus, *R. cotinus*, the 'Venetian Sumach', is also to be found here. In late SUMMER the rounded, much-branched inflorescences are covered with a fine down, and turn a blue-grey or purplish-grey colour in the AUTUMN, giving at a distance a misty effect—it is sometimes on this account called the 'Smoke plant' or 'Wig plant'.

With the Sumachs are planted species of *Koelreuteria*, a tree from China, which is covered in July and August with yellow flowers, followed later on by remarkable bladder-like fruits. *Ptelea trifoliata*, Hop plant, is also to be seen here—its inconspicuous flowers are succeeded by curious, veined, disc-like fruits. The Ruined Arch is hung with Ivy, and species of *Clematis* tumble down the sides from the top.

Beyond the Ruined Arch on the left is the collection of Buckthorns (*Rhamus*). *R. purshiana* is of some interest as the drug *Cascara sagrada* is obtained from the bark. Our own species, *R. cathartica* has similar but more violent properties.

On the other side of the path leading to the Temperate House, is the Flagstaff mound upon which stands the spar of Douglas Fir, 214 feet long,* presented to the Gardens by the Government of British Columbia, and erected in 1919 to replace a smaller flagstaff from the same source. At the foot of the mound is a bed planted with a variety of species including *Euonymus* and spiny *Berberis*. Just opposite is a group of Camellias, shrubs with beautiful flowers. The collection of Limes begins here and is situated on both sides of the path from this point onwards.

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* Now only 136 feet tall; see p. 6.

On the left a grassy ride leads into a depression known as the Berberis Dell (page 25). On the other side of the grassy walk is a large bed in which a number of small Asiatic trees are to be found. *Evodia hupehensis* is a small tree with gland-dotted leaves. *Ptelea trifoliata* is also found in this bed. Below the trees a large number of species of *Primula* have been planted. This bed is also planted with a variety of bulbs—crocus, daffodil, etc., which make a delightful picture in SPRING. A small patch of *Skimmia japonica*, with bright red berries, is found at the northern edge of the bed.

The next large bed on the left contains numerous species of *Berberis*, the Barberry, some deciduous, some evergreen, the leaves of the former turning a beautiful red in AUTUMN. The bed also contains a few small trees—*Dipelta floribunda* with papery bark, *Erica arborea*, the giant Heath, and the Japanese species *Trochodendron aralioides*, which is closely allied to the *Magnolia* family.

There are so many different species of the *Magnolia* family in this and neighbouring beds that this area is called the Magnolia Garden. Notable amongst these are the distinctive *M. campbellii* from the Himalaya, with large pink flowers, the Japanese *M. salicifolia*, with willow-like leaves and erect habit, and the Japanese *M. parviflora* with its handsome white flowers and mass of crimson stamens. Also to be found here is a fine specimen of the Tulip Tree (*Liriodendron tulipifera*), a valuable timber tree of the S.E. United States and a member of the same family.

In the next large bed is a tree which must not be missed. This is *Eucalyptus gunnii*, a native of Tasmania and South Australia, one of the few hardy Eucalypts in this country.

This species, like most of its congeners, has the juvenile leaves quite different from the adult leaves. The young leaves are orbicular in shape and opposite, while the old leaves are alternate, narrow and pointed at both ends.

The next bed on the left contains, besides *Magnolia grandiflora* with large white flowers in SUMMER, a specimen of the Chilean timber tree, *Nothofagus dombeyi*. On the same mound is the Temple of Bellona, one of the buildings erected by Sir William Chambers in 1761. A little farther on, Victoria Gate can be seen on the right, whilst on the left is a group of Snowy Mespilus (*Amelanchier*), which is a sheet of white for a brief period in SPRING, and has the most wonderful tints in AUTUMN.

The Shaft or Campanile (see page 9) now comes into view; it is covered with ivy for about three-quarters of its height. Crossing over the path which leads to the Palm House one comes to a bed of

Prunus persica on the left, a Peach with double pink flowers, which are borne in profusion in SPRING before the leaves appear. Passing the Temple of Arethusa (see page 7) on the right, turn right at the Pond (see page 27). On the right of the path the long bed is planted with bushes of *Forsythia*, *Prunus serrulata* and various species of Rhododendron, all of which produce pretty flowers in SPRING and SUMMER. *Mahonia*, *Hypericum* and Ivy are used as low shrubs to cover the soil.

Pass in front of Museum No. I and take the first turning on the right. Just beyond the Museum is a drinking fountain and behind it a specimen of *Prunus yedoensis*, the Tokyo Cherry, which is covered with faintly scented pink blossom in SPRING. The bed in which it stands is planted with a shrub belonging to the Box family, *Sarcococca chinensis*, which has sweet smelling flowers produced in February. On the left is the Mound Garden (see page 21), while on the right is a long bed with many varieties of *Camellia*, whose scarlet and white flowers are a delight in SUMMER. Among them are several specimens of the Almond, *Prunus amygdalus*, which are among the earliest plants to flower at Kew, and are covered with their pale pink blossom in February. With them are many species of the smaller Rhododendrons, also Laurels, Heaths, *Fothergilla monticola*, a shrub from the U.S.A., species of *Sarcococca* and *Daphne*.

At the end of the path the Cumberland Gate is on the right, and a little way to the left the entrance to the Herbaceous Garden (see page 18) is on the right. Beyond the Herbaceous Garden, the next turning on the right leads straight to Cambridge Cottage Garden (see page 22).

The first part of the path runs along the wall of the Herbaceous Garden. In the bed skirting the wall is the collection of hardy ferns. In the bed on the left is the collection of the Asiatic *Eremurus*, with tall spires of white, yellow or pinkish flowers, species of dwarf Iris and other plants.

After passing Museum II, which is at the end of the path on the right, the Iris Garden on the left will be seen, in the centre of which is a statue 'Out in the Fields', by Mr. A. G. Atkinson, and presented to the Gardens by Mr. A. T. Hare. Here are collected in a magnificent SUMMER display many of the more beautiful hybrids of Iris. Trees on the lawn include specimens of *Arbutus*, the Strawberry Tree and two trees of a beautiful 'seed hybrid' between the Common Thorn and the Medlar. To the right of the path is the Aquatic Garden (see page 27).

The path leads straight into Cambridge Cottage Garden (see page 22). Turn to the left at the gate and proceed forward towards the

Iris Garden and Museum II. May

curiously branched Pine which will be seen straight ahead. The wall on the right is remarkable for the number of trees growing upon it; there are several Thujas, a Pine and a Lilac. These trees must derive their mineral requirements entirely from the mortar and bricks of the wall, and their water supply from casual showers of rain, augmented by the spray which is used from time to time to water the Lilac beds in Cambridge Cottage Garden on the other side of the wall.

Just beyond the second entrance to this small garden is a specimen of *Laburnum adami* which will be seen on the right hand side. This tree is what is termed a 'periclinal graft-chimaera' and arose as follows. In 1825 M. Adam, a nurseryman of Vitry, France, bud-grafted the small semi-prostrate purple Broom, *Cytisus purpureus*, on to the common Laburnum. From the region of the bud a shoot developed which was very different from either of the two species concerned. This single shoot has given rise, by vegetative means of propagation, to all the specimens of *Laburnum adami* to be found in gardens.

This species occasionally produces branches which are wholly Laburnum, others that are wholly Purple Broom, and again others which are intermediate in character between the two. This remarkable state of affairs is explained by the fact that this tree consists of a core of the common Laburnum surrounded by a superficial layer of *Cytisus purpureus*. Other examples of the 'periclinal graft-chimaera' will be found south of the Temperate House, the so-called *Crataegomespili* (see page 97).

On the left are beds containing various shrubs and trees. Among them a wild Chinese Rose, *Rosa hugonis*, is covered with single yellow flowers in May, and the stems are armed with many translucent, red, flat spines. It was introduced to Kew at the end of the last century.

The curiously shaped Pine, a well-known landmark at Kew, is *Pinus pinea*, the Stone Pine. The strange form of this tree, with a broad flat crown and large branches almost from the base, is always assumed when the tree is grown in the open. It grows into a magnificent straight-boled tree when grown in a forest stand in its home in south Europe. The seeds are about three-quarters of an inch long and the contents are edible. This tree is much valued in Italy for the seeds even at the present day, and from the fact that the husks of the seeds have been found in the refuse heaps of Roman encampments in this country, it is fairly safe to conclude that the seeds were sent over from Italy for the use of the Roman soldiery.

Just beyond the back entrance to the Fernhouses will be seen

Magnolia stellata. This Japanese species produces a succession of pure white fragrant flowers in SPRING, while the shoots are still bare.

A little farther on to the right is a specimen of *Metasequoia glyptostroboides*, sown in 1948 from seed obtained from the type locality, China, and planted out in 1949. This tree is of extreme interest to botanists because it is possibly the only genus which was known as a fossil before being found in the living state. Certain fossils from the late Mesozoic (70 million years ago) had been referred to the genus *Sequoia*, but in 1941 it was decided that they could be placed in a genus of their own, *Metasequoia*, signifying that this new genus was close to *Sequoia*. Four years afterwards a tree was found by Chinese botanists in Szechuan, near the Hupeh border, and has been attributed to the fossil genus. The tree is also of interest in that it adds another to the very few species of Conifers which shed their leaves in the WINTER.

Crossing over the path (Route A, see page 63), with its two deciduous Cypress trees, the Orangery can be seen through the trees ahead. This building was erected in 1761 by Sir William Chambers for Princess Augusta. The Princess's initial and arms can be seen on the building, which is regarded as a very fine example of Georgian architecture.

There are, however, several interesting trees between the Cypresses and the Museum. The first to be seen is the Turkish Hazel, *Corylus colurna*, on the left. This species grows into a large tree and is the finest of the Hazels. It was introduced into England about the middle of the seventeenth century.

A little farther on to the left, the Black Walnut is met with, and just beyond, Lucombe's Oak. Lucombe's Oak is supposed to be a hybrid arising from a cross between the Turkey Oak and the Cork Oak. The Black Walnut is a far handsomer tree than the common Walnut, but the nuts are useless. On the lawn to the left will be seen some very large and ancient Elms, possibly the survivors of those planted by Princess Augusta.

At the right hand side of the path can be seen beds of *Philadelphus* and hybrid Lilacs, and a bed of *Viburnum tomentosum*, which produces its heads of pure white flowers in two rows along the branches in early SUMMER. The inflorescence is interesting because the centre is occupied by the fertile flowers while the larger and more conspicuous sterile flowers are arranged on the periphery.

Close to the Orangery is a fine Atlantic Cedar. In front of the building are three large beds which are filled with beautiful flowering herbaceous plants according to the season.

ROUTE D

Lion Gate—Conifers—Route B.

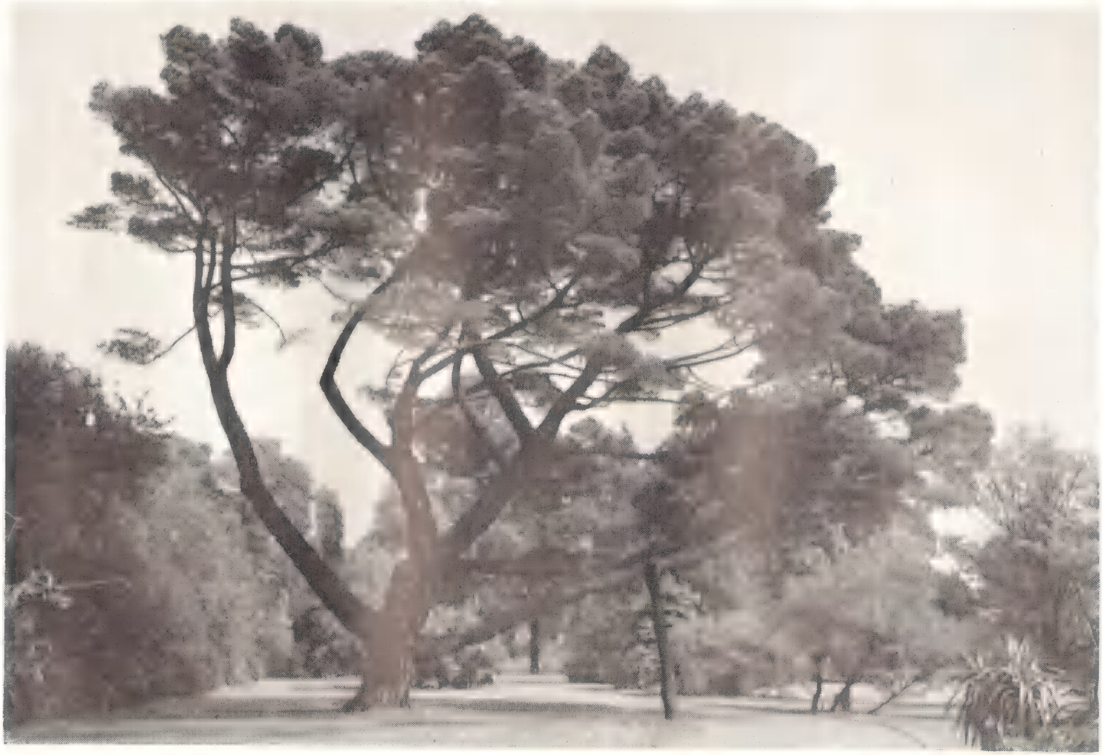
Enter at the Lion Gate, pass straight down the path which lies ahead. On the left, that is, on the southern boundary of Kew Gardens there is a thick growth of evergreen shrubs and trees, among which species of Rhododendron and Holm Oak (*Quercus ilex*) are the most numerous. After a short distance the Pagoda will be observed on the right.

The first path to be met with is Holly Walk (page 69). Passing under the shade of tall beech and elm trees, another path leading to the Oxenhouse Gate, on the left, is crossed. The trees about here are mainly beech, oak and some conifers. The path curves to the right and passes through the collection of conifers. The main collection of conifers which is now being entered is centred in an area lying south and south-west of the lake. It will have been noticed that cedars, pines, larch and other conifers are to be found all over the Gardens, but in this area an attempt is made to group related species together. All the species which are hardy at Kew grow here, but few of them reach perfection, for they cannot flourish in an atmosphere polluted with smoke, nor do they like the hot, dry summer, so frequent in the Thames Valley.

Proceeding forward, it must be remembered that the plan has been to plant New World species on the right and Old World species on the left of the path. First of all we meet the *Thuyas*. The most remarkable of the Thuyas is *Thuja plicata*, which reaches a height of over 200 feet in Oregon. Next to the Thuyas, and bordering a path to the Temperate House (page 55), will be found the larch collection. These graceful deciduous trees afford a timber which is highly prized. *Larix occidentalis* from the Western U.S.A. is represented here by three or four of the largest trees in the country.

The Cypresses succeed the Thuyas, the Japanese species being on the left of the path and the American on the right. The Japanese *Chamaecyparis obtusa* gives an excellent timber and from it the Chokushi Mon (page 7) was made. *Chamaecyparis lawsoniana*, a giant tree from America, reaching over 200 feet in height in its home in Oregon, is represented by many variants which differ in colour of foliage and mode of growth.

Next on the left hand side comes *Cryptomeria japonica*, one of the most important timber trees of Japan. In Japan the timber is hard and durable, but when the species is grown in the warm humid climate of India, it produces wood which is so soft that it can be used for corks.



Stone Pine (*Pinus pinea*)

Opposite the *Cryptomerias* are representatives of two of the most wonderful of the world's trees, viz., the Redwood (*Sequoia sempervirens*) and the 'Big Tree', or Wellingtonia (*Sequoia wellingtonia*).* In its home in California the Redwood attains a height up to 340 feet with a trunk 28 feet in diameter at the base, and has the distinction of being the tallest tree in the world. The timber is much prized for its durability, especially where it is used in contact with the ground. The beautiful reddish brown, spongy fibrous bark to which it owes its popular name is well shown by the young and comparatively small trees growing here.

The 'Big Tree' (*Sequoia wellingtonia*)* can claim to be the largest tree in the whole world, for though it does not attain the height of the tallest Redwoods, in girth and volume of timber it far exceeds it. The age which these trees attain is very great, and a section of a stem in the Wood Museum shows 1,335 annual rings. In the opinion of experts they reach a much greater age than this. The timber of this tree, like the Redwood, is very durable in contact with the soil, and fallen logs have remained quite sound on the forest floor for centuries. Although living species of *Sequoia* only number two, the genus is a very ancient one and some 40 fossil species have been described.

Next come the collection of Yews in which, in addition to the numerous varieties of our common Yew, *Taxus baccata*, the Canadian Yew, *T. canadensis*, and the Japanese *T. cuspidata*, are represented. Apart from the very characteristic Irish Yew (page 70), the wide-spreading Dovaston Yew (var. *Dovastonii*) is also to be found here. The latter is a very distinct and handsome form with an erect stem and widely spreading branches drooping at the tips. It is a very old variety and is said to have been first noticed about 1777, when Mr. John Dovaston of Westfelton, near Shrewsbury, bought for 6d. a young yew from a cobbler in the village.

Opposite the yews is a very interesting group of exotic Conifers, among them *Sciadopitys verticillata*, *Cunninghamia lanceolata*, and a species of *Podocarpus*.

The Umbrella Pine, *Sciadopitys verticillata*, is easily recognised by its united pairs of glossy-green leaves, arranged in whorls like the ribs of an umbrella. It reaches a height of 120 feet in its home in Japan and as it is extremely slow growing, it must attain a great age.

Cunninghamia lanceolata, known as the Chinese Fir, is one of the well-known coffin woods of the Chinese, and is much sought after for this purpose. The sharp pointed leaves look as if they were in two ranks; actually they are spirally arranged, but those arising

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* Now *Sequoiadendron giganteum*.

below come to be in a horizontal plane by reason of a basal twist in the stalk.

The many species of *Podocarpus* range over the warmer regions, being common in the southern hemisphere and extending into China, Japan, India, the Malay States, and the Philippine Islands. Most of them are important timber trees in their own homes. Only a few species are truly hardy in Britain and, of these, the dwarf *P. alpinus* is one of the very few Australian shrubs which can be grown out-of-doors in this country. *Podocarpus andinus* (*Prumnopitys*) is an interesting species from South Chile which does well at Kew. It is very like the Common Yew in appearance, but the foliage is less sombre. The fruit is like a damson in size and shape, but yellowish white in colour. Just beyond this point a path coming from Queen's Cottage grounds on the left crosses the path.

A little farther on and to the right is the Lily Pond (page 29). A collection of hybrid Water Lilies is grown in the pond and gives a fine display in SUMMER. It should be remembered that these plants are at their best in the mornings, when the flowers are fully expanded. In addition to the horticultural varieties of the White Water Lily, some of the tropical white and red species are also planted annually, and these bear their flowers well above the surface of the water. Growing in the pond is to be seen a fine specimen of the Swamp Cypress, *Taxodium distichum*.

Opposite the Lily Pond, on the other side of the path, are species of the eastern Asiatic genus *Cephalotaxus*, allies of the Common Yew, but with comparatively large plum-like fruits. Interspersed among the *Cephalotaxus* are a number of small trees of *Ginkgo biloba*.

Farther on the path joins Route B, close to the western end of the lake. From the Lily Pond to Route B, and from that point to the Isleworth Gate, the collection of Pines is found on both sides of the paths. In addition a number of spruces are to be found due north of the Lily Pond.

The Pines are perhaps the most important group of timber-producing trees in the Northern Hemisphere. Many of the species, when tapped, yield oleoresin which, on distillation, furnishes turpentine and rosin.

The term Pine is often applied by the layman to any coniferous tree, but the true pines are distinguished by the possession of long needle-like leaves which are gathered into bundles of 2, 3 or 5. Ranging as they do, over the whole of the Northern Hemisphere, the pines show great diversity of form. Some species are prostrate while the giant pines of North America soar up to over 240 feet.

Most pine cones are small but some of the American pines form cones up to 18 inches long, and *Pinus coulteri*, aptly named Big Cone Pine, has a cone over 4 lb. in weight. *Pinus muricata*, whose cones persist on the branches for over 25 years, possesses the remarkable power of surviving the forest fires that periodically sweep through the forest in its native home. Fires that are fierce enough to kill the tree merely open the cones sufficiently for the unharmed seed to drop out on the bared soil of the area devastated by the forest fire. One pine worthy of notice for its peculiar bark is the Lace-bark Pine, *P. bungeana*, of China. The bark on young trees is smooth dull grey, and scales off in patches like a plane tree, changing to chalky white on older trees.

ROUTE E

Main Gate—Broad Walk—Rose Garden—King William's Temple—Hawthorns—Mountain Ashes—Whitebeams.

Enter by the Main Gate, the gates and pillars of which were designed by Decimus Burton and erected in 1845. They are recognised as being a masterpiece of their kind—dignified and at the same time restrained. Pass directly down the Broad Avenue immediately in front. There are two fine hybrid Magnolias just inside the Gate. That on the right is *Magnolia soulangeana*, which is believed to be the result of a cross between *Magnolia denudata* and *M. liliflora*, both natives of China. The flowers make their appearance in SPRING on the bare branches and are white inside and more or less stained with purple on the outer surface. On the left is *Magnolia lennei* which is presumed to have the same parentage as *M. soulangeana*, but in this hybrid the flowers are rose-purple outside. Although the main flowering of both these handsome shrubs is in SPRING, they may in favourable years flower again in AUTUMN. In the SPRING Japanese cherries in the vicinity will be in full flower, and one worthy of notice for its perfect shape will be seen in front of the Aroid House (page 30).

On each side there are Indian Horse-chestnuts, *Aesculus indica*, which differ chiefly from the European species in having reddish flowers. At the end of the avenue on the right is a statue, the Sower, by Sir Hamar Thornycroft, presented to the Gardens by the Royal Academy of Arts.

Turn to the left at this point leaving the Orangery (page 8) on the left, proceed down the Broad Walk to the pond. The walk is bordered on both sides by rectangular beds in which beautiful herbaceous and bulbous plants are displayed, while as a background to each bed is a kidney-shaped bed planted with select hybrids of rhododendrons, which are at their best in the latter half of May and in early June. Halfway down, the walk crosses Route A (page 63). Just beyond this point, and on the left, is a magnificent group of Japanese cherries which carry loads of blossom in SPRING. Close by is an interesting *Arbutus*, *A. menziesii*, from California, which attracts attention by its smooth skin-like cinnamon-coloured bark with curious black patches at the forks.

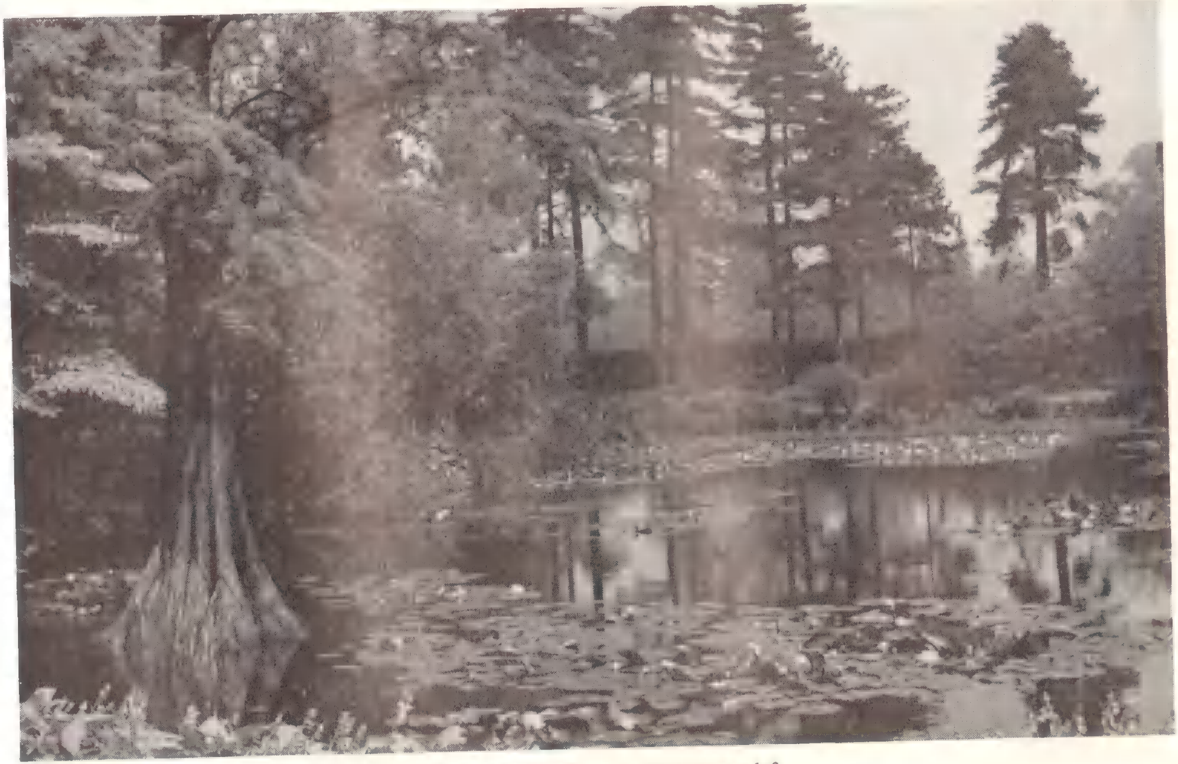
On the lawn to the left will also be seen a perfect specimen of the weeping beech, *Fagus sylvatica* var. *pendula*.

Turn to the right at the pond (page 27) and, passing between the Palm House (page 51) and House No. 15 (page 49), enter the Italian Rose Garden which is enclosed on its western side by a semicircular holly hedge.

Follow the path round and take the second path on the right, which is bordered on both sides with Japanese varieties of the flowering cherry (*Prunus serrulata*). They, and the large group of the same tree on the left, are magnificent in SPRING. The cherries are underplanted with *Muscari comosum*, the Grape Hyacinth, and the combination of the blue with the colour of the cherry flowers is particularly effective.

Follow the path to King William's Temple (page 6) built upon a low mound. Close by on the left is the collection of Witch-Hazels which open their quaint golden yellow flowers in the late AUTUMN, WINTER and early SPRING, when the branches are still bare, whereas in their native home they flower with the sudden onset of SPRING. Near them are the species of Cornel or Dogwood, of which the Cornelian Cherry (*Cornus mas*), a European species with its wealth of tiny yellow flowers opening in early SPRING, has long been a favourite in gardens. In May, *Cornus nuttallii* comes into flower. This tree is a native of western North America and is remarkable for the large white petal-like leaves which surround the small head of flowers. Two large specimens of the Chinese Tree of Heaven, *Ailanthus altissima*, can also be seen on the mound. The generic name is derived from 'Ailanto', the native name for another species, signifying a tree so tall that it reaches the skies.

On the western and northern side of the Temple are found many species of the Heath family (*Ericaceae*). This family includes the Rhododendrons, many of the smaller species of which are found on the mound with *Arbutus*, heather and the heaths. The latter genus (*Erica*) is well represented, and extensive groups are to be found here.



Lily Pond with Swamp Cypress on left

Between King William's Temple and the Temperate House are a series of ten long rectangular beds. They accommodate a mixed collection of trees and shrubs, including various members of the *Prunus* family (Cherries, Almonds, Plums, etc.), *Viburnum*, Lilacs, *Diervilla*, Snowberries (*Symphoricarpus*), *Elaeagnus*, *Buddleia*, Sweet Gale (*Myrica*), Box-thorn (*Lycium*), and Osage Orange (*Maclura*). The path is bordered with specimens of early flowering *Prunus* (*P. subhirtella*), between which are handsome evergreens, *Phillyrea* from South Europe on one side and Box (*Buxus*) on the other.

Proceed through the Temperate House (page 55) and walk down the grassy avenue leading south a little to the right of the Pagoda, which can be seen in the background. On both sides of the central grassy avenue is a row of roughly rectangular plots, three on each side, each surrounded by a wide bed. The species to be found here belong exclusively to the rose family. The important genus *Rosa*, however, is displayed at the southern end of the Holly Walk and on the south-western side of the Palm House. The plots and the avenue here are planted with the numerous species and varieties of Thorn (*Crataegus*), Pears and Crabs (*Pyrus* and *Malus*), and Whitebeam (*Sorbus*). The beds are occupied by bushy species such as *Cotoneaster*, *Potentilla*, *Amelanchier*, Quince (*Cydonia*), *Neillia*, and other shrubs.

Certain genera are grouped together. For example the first plot and surrounding bed are almost exclusively given over to the genus *Cotoneaster*, which is mainly, but not exclusively, found in the cooler parts of the Himalaya and West China. This genus shows the most diverse habit, some species being tall and spreading, and others lower and prostrate, but they all have one characteristic, namely, their pretty white flowers are succeeded in the AUTUMN by the even prettier fruit. The bright scarlet berries hang on the branches far into the WINTER. The southern end of the most northerly plot is given over to the collection of Chinese Brambles, mostly species collected in China early in the century. The species with stems which look as if they were white-washed are of special interest. North of these is a collection of British Brambles (Blackberries).

The trees are in full flower in May when the Hawthorn scents the air. The white or pink flowers are succeeded by berries, most often bright scarlet, which make a wonderful show in the AUTUMN.

On the southern border of the first bed on the right are three trees which are of exceptional interest. One of these is a natural hybrid between the Hawthorn and the Medlar. It is called *Crataegomespilus grandiflora*. The other two are graft hybrids of the same two species.

These two graft hybrids arose spontaneously in 1825, in the garden of M. Dardar near Metz, from an old Medlar tree that had been grafted on a stock of Hawthorn, when two branches appeared below the junction of the graft. One of these, *C. dardarii*, produces (on the same tree) three types of branch, flower and fruit—two of them intermediate between the two parents, and the third pure Medlar. The other hybrid, *C. asnieresii*, is intermediate in form between the two species and does not deviate from it.

These two trees are 'periclinal chimaeras', and it is believed that each is composed of a core of the Common Hawthorn surrounded by one external layer of the Medlar in *C. asnieresii*, and two layers in *C. dardarii*.

Crossing over Cedar Vista, the Pagoda will be seen to the left and the end of the lake at the end of the vista on the right. On the right will be seen Chokushi Mon on its mound surrounded by very old cedars. On the left the beds contain the spring flowering heaths with Cydonias and other shrubs. After crossing over the Yew Walk the southern road is reached (Route A).

ROUTE F

Palm House—Azaleas—Beeches—Hornbeams—Bamboo Garden.

Leaving the Italian rose garden by the first path to the right, follow the path leading to the Ash collection (see page 68). Just outside the holly hedge are two bushes of a hybrid *Escallonia*, one on each side of the path. All the species of *Escallonia* come from South America and most of them from Chile. The flowers are attractive, being white or red, and are produced in profusion. On the lawn to the left can be seen a specimen of Bhutan Pine, *Pinus wallichiana*, an attractive conifer from the Eastern Himalaya, and also Bishop's Pine, *Pinus muricata*, from California. Cross over the two paths and proceed through the Ash collection (see page 68) towards a Cedar Tree (*Cedrus atlantica*) a little to the right of the path.

At this point a visit can be paid to the Azalea Garden. The Azaleas are probably at their best in late May, when the shrubs are in full bloom, delighting the eye with a gorgeous riot of colour of many shades and scenting the air all around with their delicate perfume.

Originally planned by Sir Joseph Hooker on this site in 1881, it has been much enlarged since his time, as more and more species and hybrids have been discovered.

Botanically the Azaleas belong to the genus *Rhododendron*,

The Lake in Autumn

differing from the more familiar species of that genus in having deciduous leaves without scales and only five stamens. (It will be remembered that the rhododendrons possess evergreen leaves with ten stamens in the flower). They are, however, quite distinct in appearance and some very attractive hybrids have been produced by inter-crossing some of the beautiful species found in the Eastern United States with *Rhododendron luteum* from Asia Minor. Some of these hybrids were raised at Highclere Castle, near Newbury, early in the 19th century. In later times the Japanese and Chinese species, *R. molle* and *R. sinense*, were introduced and these, flowering rather earlier than the previous group, have added much to the attractiveness of this section of the genus. Species of *Magnolia* and *Liriodendron* which are planted in and about the Azalea Garden contribute a great deal to the beauty of this area.

Just north of the Azalea Garden is the collection of Hornbeams (*Carpinus* spp.) of which our native species, *C. betulus*, is represented here by several varieties. This tree, with its grey, often elegantly ridged and fluted trunk, conspicuously ribbed leaves and umbrageous crown, is one of our handsomest trees, but so frequently pollarded that its full beauty is seldom attained. Near here can be seen the Hop-Hornbeam with hop-like female catkins.

To the north-west of the Azalea Garden are the Hazels and Filberts (*Corylus*), best known by the two species *C. avellana* and *C. maxima*, which give the common dessert nuts.

Return to the path and just beyond the Azalea Garden cross a path on the right which leads into the Rhododendron Dell (see page 15). This path is called Stafford Way. Proceed forward under the shade of fine Beech trees on the left and *Nothofagus* on the right. The collection of Beeches (*Fagus* spp.) is to be found here. The Beeches and the Southern Beeches (*Nothofagus*) are closely related, but they live in different hemispheres. The Beeches, which are found in the northern hemisphere, are usually fine umbrageous trees. Our native species, *Fagus sylvatica*, is represented by its many varieties, of which the Purple Beech is perhaps the best known. This is not a garden variety but is believed to have arisen spontaneously. According to legend, one group of five arose on the spot where five brothers had killed one another. The purple variety comes partially true from seed, and some deeper coloured and brighter forms have been obtained in this way, as, for example, the Copper Beech, which is so popular. The majority of the seedlings, however, are green or only slightly coloured. There is a very fine specimen of a Liquidambar tree just north of the Beeches.

A little farther on is an open space through which the lake can be seen a hundred yards to the left. On the right is a vista which runs through the Beech and Hornbeam forest to a point where Stafford Way issues from the Rhododendron Dell.

On the other side of the vista and on the left of the path will be seen two small trees of *Castanopsis chrysophylla*. This species, called Golden Chestnut in its home in California, where it is said to reach a height of 100 feet or more, is easily recognised by the evergreen leaves, the under-surfaces of which are covered with a beautiful golden scurf, and the curious burr-like fruits that are sometimes produced freely.

Shortly afterwards the path curves to the right under the shade of very fine Sweet Chestnuts and finally enters the Bamboo Garden (see page 17) from the east.

If one proceeds straight forward instead of entering the Bamboo Garden the beginning of the Oak collection (see page 78) at Mount Pleasant is reached.

Pitcher Plant
(*Nepenthes mixta*)

The Museums

THE Kew Museums consist of three separate buildings two being devoted, in the main, to economic plant products and the third to woods.

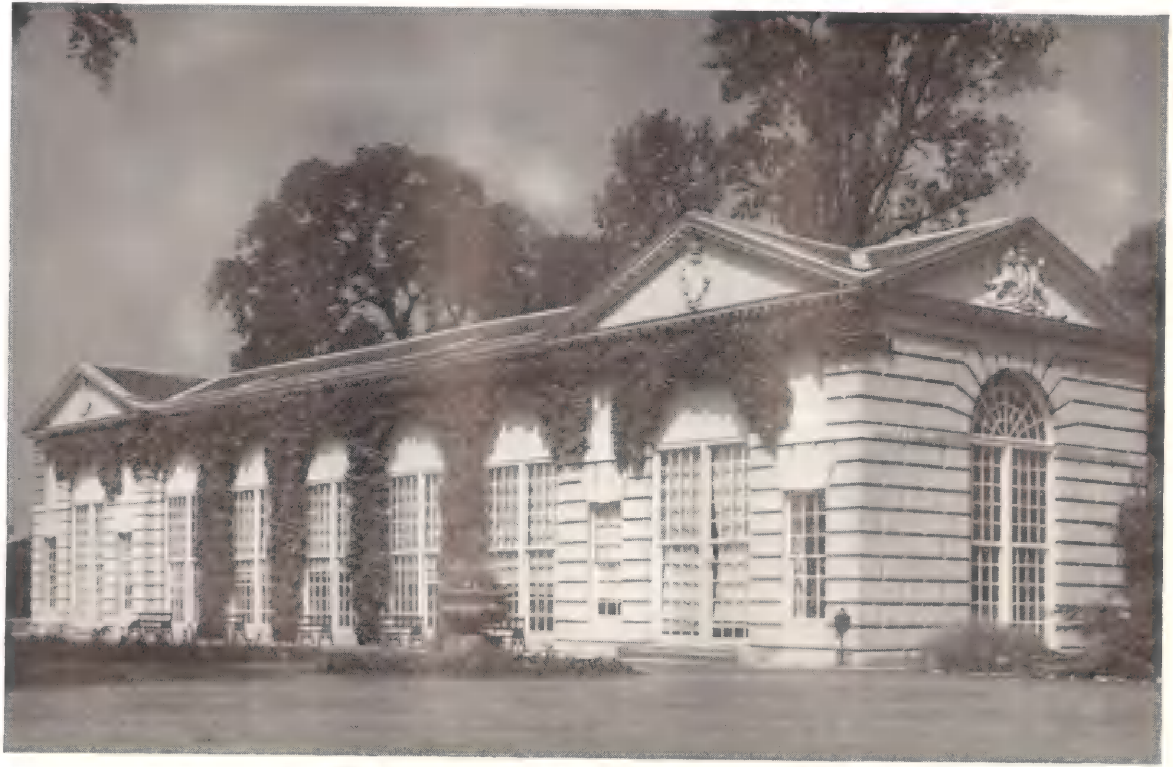
MUSEUM No. I

Museum No. I is a large building near the pond at the end of the Broad Walk—opposite the Palm House. It is here that the main museum collections are housed, for the building is devoted to the economic plant products that are derived mostly from that large section of the Vegetable Kingdom known as the Dicotyledons.

On entering the building it will be noticed that the specimens of economic products on the ground floor are mainly arranged according to their uses, several cases being devoted to foods and food products.

One of the first cases to be seen is that devoted to edible oils and fats. These are important constituents in the food of man and may represent about one-sixth of his normal diet. Owing to the growing world population they are now being consumed in increased quantities. Often the oil or fat eaten by man is predominantly of animal origin, as with the Eskimos. On the other hand, the oil intake of many peoples is mainly of vegetable origin as, for example, certain races in the forest areas of tropical West Africa. Here the presence of tsetse fly prevents the keeping of cattle and most forms of livestock, but the African oil palm flourishes and is a common source of edible oil. The natives in these regions consume large quantities of this oil with their meals. Not only is the oil wholesome as such but, when freshly made and used, it is a good source of certain vitamins. Most of the world's peoples, however, rely on a mixture of animal and vegetable oils or fats for their sustenance.

As the world has advanced most peoples have tended to increase their consumption of oils and fats, such as butter, margarine and edible oils. It is considered that 20 to 30 per cent. of human energy could be obtained from such sources if they were available in sufficient quantity. Weight for weight, oils and fats yield more energy than cereal foods or meat. They are the most concentrated form in which heat and energy producing food can be supplied to the body. As man has a relatively small stomach compared with many animals and cannot with comfort take large quantities of low energy foods,



The Orangery. Built by Sir William Chambers, 1761 fats are of special value to him. Before the war, countries which consumed the largest proportion of fats were those which were most prosperous and which had the highest output of work per man. In addition to the more obvious and visible forms of fat there are also what have been termed the 'invisible' fats. These are small quantities of fat that are present in most foods, although they may not be in any way obvious. For instance, lean meat contains 6 to 8 per cent. of fat, rabbit 5 per cent., dried egg 42 per cent., flour 1 to 2 per cent., bread 1 per cent. and oatmeal 8 per cent. Even green vegetables contain a small percentage of fat, 0.1 to 0.2 per cent. These so-called invisible fats are important in the aggregate and are considered to supply about half of our total daily intake of fats. The high calorie value of oils and fats makes it possible to obtain a high energy intake without a meal becoming too bulky. This explains the relatively large consumption of fat characteristic of miners, agricultural and other heavy manual workers when supplies are unrestricted. Furthermore, the presence of sufficient fat in the diet is considered to have a bearing on the efficiency with which other foods, including vitamins and provitamins, are utilized in the human body.

Among the edible oils that are now so much used in the manufacture of margarine, the oil obtained from the groundnut (*Arachis hypogaea* L.) has come to occupy a prominent position. Groundnuts from various countries, with samples of oil and other products derived from them, are to be seen in the case devoted to the groundnut. A curious feature of the groundnut plant is that its fruit or nuts are developed and ripened underground. The plant is an annual, a member of the bean or pea family (*Leguminosae*) and may be of erect, trailing, or semi-trailing habit, according to variety. In height the plant does not exceed 2 to 3 feet and resembles a clover in general appearance. The leaves, also like those of clover, fold up at night. The pea-like yellow flowers appear on the lower parts of the stem in the leaf-axils. As soon as fertilization has taken place and the petals have started to wither, which may be on the same day as the flower opens, the flower-stalk elongates downwards in an amazing fashion and pushes the fertilized ovary, protected by the calyx and flower remains, into the soil, where it immediately begins to develop and, in the course of four or six weeks, ripens into the mature fruit or pod containing two or more seeds. If the elongating flower stalk, or 'peg' as it is often called, should strike a hard surface on reaching the ground, so preventing the ovary from being pushed into the soil, it withers and dies and no pod is formed.

The groundnut is one of those economic plants which has been cultivated by man for a long period and has never been found in a truly wild state. There has been controversy in the past as to whether it is of African or South American origin, but the more recent discovery of undoubted groundnut remains in old tombs in South America leaves little doubt that the plant is of South American origin. The fact that the only other known species of *Arachis* are South American and not African is also significant. It is believed that the early Portuguese explorers first brought the groundnut from Brazil to West Africa, perhaps as rations on their ships, so that its introduction into Africa was more probably accidental than deliberate; the same people may also have taken it to India. Its adoption doubtless spread rapidly, native people being quick to appreciate the virtues of the crop, its ease of cultivation, quick return and high food value for man and beast. Mohammedan pilgrims and traders may also have been agents in its early dissemination in many parts of Africa and Asia. It is also thought that the groundnut may have reached the Far East and the Pacific region independently from South America about the time of Magellan (early 16th century).

The United States is now one of the main groundnut-producing countries of the world, and it is interesting to note that although the groundnut is a South American plant, it is believed to have reached North America from West Africa through the agency of the slave ships. It was grown by slaves in Carolina and elsewhere in the 18th century. A liking for groundnuts or peanuts is said to have sprung up in towns of the United States after the Civil War, for soldiers of the northern army brought back a taste for them after their invasion of the South. At that time farmers in Virginia (which both armies occupied in turn) commonly grew small plots for their own use.

An important use for the groundnut or peanut is in the manufacture of peanut butter, to which a large proportion of the American crop is devoted every year. Great care is exercised in the preparation of a high-grade peanut butter. Nuts of different varieties may be blended to obtain just the desired flavour. Roasting and grinding require careful attention. In grinding, the right degree of fineness must be achieved; if too fine the butter clings to the roof of the mouth; if too coarse it is gritty.

The groundnut kernel usually contains 40 to 45 per cent. oil and 25 to 30 per cent. protein, but the composition varies with different varieties. Groundnut oil may range in colour from pale yellow to light brown and the best qualities have a bland pleasant flavour. It has good keeping qualities and does not easily go rancid. The oil is much used as a substitute for olive oil, and in packing tinned fish.

Inferior grades of oil are used in soap making. The residue or press-cake from oil extraction, which still contains some oil, is rich in protein and is an excellent food for livestock.

Another important oil seed and food plant exhibited here is the Soya bean, *Glycine max* Merr., which has been grown in increasing quantities in many parts of the world, including several countries of the British Commonwealth. This pulse has long been a staple food with the Chinese and other Oriental peoples who use it as food in a great variety of ways. The bean is often eaten in the sprouted condition when it constitutes a food rich in vitamins. The pods may be picked while still green and the immature beans used as a vegetable. Dried and ground it forms a flour or meal from which a kind of bread is made. Ground when moist and curdled it provides the famous bean curd or *tofu*—a substitute for meat. The bean curd itself may be treated in many ways to provide a variety of different dishes. Fermented it is employed in many sauces as flavouring for food. The oil is much used for cooking and the press-cake as food for domestic animals. Many Chinese do not drink milk nor eat meat except on festive occasions. Nevertheless, they are able to accomplish a twelve-hour day of hard physical labour seven days a week. The large proportion of soya bean in their diet is considered to be responsible for this and to account for the comparative freedom from dental and digestive troubles that many of the Chinese enjoy.

The Soya bean and its oil has many industrial uses. Unfortunately the bean does not appear to be well suited for large scale cultivation in the climate of Britain. The oil is of the semi-drying class and finds application in paint manufacture. A recent use for soya meal or soya 'grits' in Britain has been as an ingredient in sausages in order to increase the protein content and nutritional value.

Olive oil is still the foremost edible oil in many European and Mediterranean countries as it has been from the earliest times. In the producing countries of Europe demand now exceeds supply and there is considered to be little likelihood of greatly increased production. The olive tree takes many years to come into profitable bearing. In Australia, the southern United States and South America, olives have been planted and a certain amount of olive oil is now produced commercially.

Other edible vegetable oils of commercial importance which may be seen are those derived from cotton-seed, rape, sunflower and sesamum.

Throughout the tropics, particularly in Africa, there are several oil seeds, mainly from forest trees that are regularly used by the local inhabitants as sources of edible oil to meet their own domestic requirements. Most of these have not yet been used as commercial sources of oil, but may be in future. One of the best known and extensively used of these oil seeds, specimens of which may be seen, is the West African Shea nut (*Butyrospermum parkii* Kotschy). The tree yielding it is widely distributed in west tropical Africa and the Sudan, mainly in the savannah areas. The kernel of the nut contains up to 50 per cent. of edible fat. The nuts may be the size of a small hen's egg and have a thin brittle shell, yellowish brown or mahogany coloured. In many areas lack of transport or a sparse population hinders collection of the nuts and large quantities go to waste every year. The tree does not commence to bear until twelve or fifteen years of age and takes about thirty years to become fully mature.

In addition to the plants yielding edible oils and fats, the other important food plants of the world are well represented and occupy a number of cases. Among those that are primarily sources of carbohydrate or starchy food the cereals take first place, although tubers like the potato and yam are of special significance in some countries.

It is rice and not wheat that has the distinction of being the most important food plant of the world, for more rice is consumed annually by human beings than any other cereal. It is the staple food of many millions in the East. There are endless forms or varieties of rice, some with large grains and some with small. They often differ markedly in their cooking qualities. While one rice may taste much like another to the palate of the average Westerner, orientals are usually very sensitive and discriminating in regard to the flavour of rice. One of the more unusual forms of rice is the black rice of Siam and adjoining areas which becomes glutinous when cooked. It is favoured for sweetmeats. Another important cereal of warm regions is Sorghum or 'Guinea corn'. It is familiar to many as the small white or brownish grain to be seen in poultry mixtures. Throughout Africa it is much used for food for man and beast, also as a malting grain for home-brewed native beer. The grain is often classed as a millet, but both the grain and the plant itself are much larger than the other millets. A field of young Sorghum looks very like a field of maize. The plant is better able to withstand dry or droughty conditions than maize, but the crop, especially in small fields, may be much reduced through the activity of birds as they are very fond of the grain.

In temperate and sub-temperate climates the potato is the all-important rootcrop grown as a source of carbohydrate food, but in the tropics there is a wide range of starchy root crops in cultivation.

The best known and most extensively used of these are probably cassava or tapioca, yam, taro, sweet potato and arrowroot. Although of South American origin cassava has become the staple food in many parts of tropical Africa. The sweet potato is another South American food plant now widely disseminated throughout the tropics and sub-tropics.

Arrowroot, the well known invalid food, is obtained from a variety of plants but especially from the white fleshy rhizomes of a reed-like plant (*Maranta*) found growing wild in tropical America and the West Indies and cultivated mainly in Bermuda and St. Vincent. The name is derived from the fact that the rhizomes were used by the Indians as an application to wounds inflicted by poisonous arrows. Even now in Dominica the starch and the pounded tubers are used by the people to make poultices for healing wounds and ulcers.

In human food the pulses are often important sources of protein and pulse crops are produced in large quantities in many parts of the world. In addition to peas and beans, crops such as lentils, chick pea, chickling vetch, cowpea, pigeon pea, lablab, black and green gram (India) are all commonly grown. Examples of most of these are shown. In order to give a better idea of the appearance of some of the pulses in the fresh state and of the various vegetables from warm regions models are used.

In all parts of the world man has made use of the local herbs and flavouring materials as spices in order to make his food more appetising. Caraway seeds, fennel, and coriander are among the age-old spices of Europe, while nutmeg, pepper, chillies, cloves and ginger are among the well known spices of the tropics. Examples of all of these are shown. Probably the chillie or 'red pepper' is the most widely used spice employed for food flavouring throughout the world at the present time. Some spices are used for medicinal as well as for culinary purposes.

The more important medicinal and drug plants are well represented. It will be noticed that with the exception of henbane, belladonna and foxglove, all of which occur in Britain, nearly all are of tropical and sub-tropical origin. Some, such as cinchona, coca and senna, have been used medicinally by mankind in their countries of origin from very early times, whereas the use of others is of much more recent date. *Strophanthus* and 'curare' (*Strychnos*) are of interest in that their original use by man was as arrow poisons, *Strophanthus* being much used in Africa and 'curare' in tropical South America.

Fruits and nuts, usually regarded as supplementary foods, always have a special appeal on account of their appetizing nature. Along with edible roots they are traditionally regarded as constituting one of the main foods of early man who relied upon hunting and what he could find in the way of vegetable products for his sustenance, having not yet learned the art of cultivating his own food crops. With the introduction of economic plants from one country to another a much wider range of fruit and nuts has become available to mankind. A good selection of these may be seen either as specimens preserved in fluid, in the dry state, or as models.

Two of the tropical fruits which usually excite special interest are the mangosteen and the durian. Both are indigenous in the Malayan region and are cultivated more there than anywhere else. Many consider the mangosteen the most luscious of all the tropical fruits. The ripe fruit is purple in colour, usually rather smaller than a tennis ball, and the rind is easily cut with a knife to expose the juicy flesh. The durian, which is the size of a small football, contains several seeds embedded in a rich creamy pulp—the edible portion. The peculiar penetrating odour of the fruit is distasteful to many.

Edible nuts may be conveniently divided into two groups, those from temperate and sub-temperate countries and those from the tropics. The almond is the most extensively grown of the cultivated nuts and more almonds are produced and consumed than any other nut. One of the best known and superior of the many kinds of almonds is the *Jordan*. Supplies are obtained only from certain districts in Spain—the name being considered to be derived from the French *jardin* (garden) signifying cultivated and not from the River Jordan or Transjordan as some suppose. The 'paper shell' almonds have the advantage that the shells are easily broken open with the fingers and no nutcracker is needed.

The Brazil nut is derived from one of the largest trees of the Amazon region, and the nuts are produced in a hard woody container an example of which is shown. These fall from the tree when the nuts are ripe and are gathered by the collectors who break the shells with a hatchet and extract the nuts. In windy weather collectors may refrain from going near the trees for if one of the hard woody fruits weighing 3 to 4 lb. and falling from a height of 100 feet should strike the head of a collector the dire consequences may well be imagined.

Another choice dessert nut of the Amazon region, so far seldom seen in England, is the Paradise or Sapucaia nut (*Lecythis* spp.). It will be noted that it somewhat resembles the Brazil nut in general appearance. The shell is much softer and may be cut with a penknife.

The kernel is also of a softer, more creamy, texture. The Paradise nut has been grown to some extent on plantation lines in Trinidad, but the main trouble has been to collect the nuts before they are devoured by the denizens of the forest such as agoutis, rats, squirrels and bats.

The cashew (*Anacardium occidentale*) is a well known tropical nut which also originated in tropical America. The kernels have been imported to Britain, mainly from India, for many years. The early Portuguese explorers took a great fancy to this nut and were responsible for taking it to India and other parts of the tropics.

Beverage plants are usually linked with or included among food plants and may also be seen on the ground floor. Tea, coffee, cocoa are important plantation industries, so also is yerba mate or Paraguay tea (*Ilex paraguariensis*) in the Argentine, where it constitutes the national drink.

Plants that provided clothing or shelter were probably considered by early man to be next in importance to those that provided food. Animal products such as skins and furs were perhaps mainly used. Bark cloths were used in some countries. Later, however, textiles such as flax (linen) and cotton, and to some extent hemp, came into general use. Examples of all the more important fibres are shown.

The drying oils are an important group of vegetable oils and are much used in the manufacture of paints and varnishes. Several may be seen in the case devoted to them. These include linseed oil (*Linum usitatissimum*) which is the most important, Tung or chinese wood oil (*Aleurites* spp.) and Brazilian oiticica oil (*Licania rigida*). Linseed oil has been the mainstay of the paint and varnish industries from their inception and forms the standard by which other drying oils are judged. It is by far the most important oil used in paint and varnish making, and also has other uses, particularly in soap and linoleum manufacture. Another important consideration is that the press-cake a by-product of its manufacture, is a much valued stock food.

Linseed may be, and has been, grown as a crop in many different parts of the world in both the sub-tropics and temperate countries. In the sub-tropics it is usually cultivated as a cool season or winter crop, as in India, or it may be grown under irrigation as in California and Texas.

In temperate countries it is grown as a summer crop. Before the 1939–45 war Argentina and the U.S.S.R. were the main producers of linseed, followed by India and the United States. Other countries ranking as important producers of linseed were Canada, Uruguay, Poland, Lithuania and Latvia. Morocco and Turkey have also produced considerable quantities of linseed for export in the past. In recent years there has been much interest in the cultivation of linseed in Britain both as an oil seed and for feeding direct to farm animals.

Tung or Chinese wood oil was not used extensively in Western countries until after the 1914–18 war, although it has long been well known and extensively used in China, especially in painting and weatherproofing junks and other boats. The oil is obtained by pressure from the seed kernel of certain species of *Aleurites*, mainly *A. fordii*, and to a less extent *A. montana*. These small trees occur in China in a region between 26° and 34° latitude North, mainly in hilly country up to about 3,000 feet (914.4 m.).

Tung oil is held in high esteem in paint and varnish making and has some unusual properties such as its high specific gravity and refractive index. Uncertainty of supplies of tung oil led to other countries considering the possibility of cultivating the trees, a lead in attempting cultivation having been given in the south-eastern United States, mainly Florida. A few years later seed obtained from both China and Florida, through the agency of Kew and other organisations, was sent to numerous British possessions where climatic conditions seemed to be favourable.

Oiticica oil is produced only in Brazil for the tree yielding the oiticica kernel occurs nowhere else. The oil possesses a characteristic, rather unpleasant smell, and it is reported that the first factory for extracting the oil in Brazil had to be closed on account of the disagreeable odour emanating from it. In the regions where the oiticica trees occur the climate is hot and dry during much of the year, and when prolonged droughts occur the yield of kernels is much reduced. The tree is slow growing and is reputed to require twelve to twenty years before bearing fruit; this militates against cultivation. Well developed trees are said to average about 30 kilos of nuts in a season.

Other important groups of economic plant products that are displayed include rubbers, gums and resins, tanning materials, dyes, insecticides and tobacco.

MUSEUM No. II

'In the year 1847, Her Majesty Queen Victoria was graciously pleased to command that those grounds at Kew which had been devoted to the kitchen and forcing department of the Palace should be added to the Royal Botanic Garden, together with the stores and other buildings. An excellent brick structure, occupied in part by the

Queen's Cottage, a Summerhouse built about 1760 dwelling of one of the foremen, and in part as rooms for preserving fruit for the use of the Palace, was thereby vacated.' Thus the building now used as Museum II became the property of the nation. Sir William Hooker, then Director of the Gardens, at once saw the possibility of converting it into a museum and so, with official assent, the necessary alterations were completed and the Queen's apple store became the first museum to be devoted solely to economic botany, with Sir William's own private collection of plant products as the nucleus. Early growth was rapid and soon necessitated larger premises. When Museum No. I was opened in 1858, the collections illustrating the Dicotyledons and the Gymnosperms were transferred to it, leaving the Monocotyledons and lower plants in the old building.

On entering the museum by the west door near the Rock Garden, an exhibit of tropical orchids catches the eye in a small room to the left. These are seen to be wax models so exquisitely wrought and faithfully coloured that they appear to be living plants. They convey some idea of the variation in form and beautiful colour patterns for which orchids are renowned and illustrate how colour and form combine in elaborate mechanisms to ensure pollination. Many tropical orchids are tree dwellers and are adapted for an arboreal life by their swollen green leaf-bases called pseudobulbs, which serve as water-storage organs, and by specialised aerial roots for absorbing water. Few orchids are put to any practical use except the vanilla, *Vanilla fragrans* (Salisb.) Ames (Case 1), a climbing plant from tropical America. The narrow bean-like fruits are collected before they are quite ripe and are dried for preparing the flavouring essence so popular in chocolates and confectionery.

Several flavouring agents and spices are obtained from the ginger family, *Zingiberaceae*, and the Ginger Lilies, *Hedychium*, are cultivated in India for their beautiful orchid-like flowers as well as for their mild ginger-flavoured rhizomes. True ginger consists of the fleshy rhizomes of *Zingiber officinale* Rosc. prepared by scraping off the skin and drying, and has a much stronger and more aromatic flavour (Case 4). The yellow rhizomes of Turmeric, *Curcuma domestica* Valeta, used in curry and the aromatic seeds of the Cardamom, *Elleteria cardamomum* Maton, are other related spices. Cardamom seeds are eaten as a condiment in India and are widely employed as a carminative and flavouring agent in medicine. A product of greater medicinal importance is Aloes. This is a dried juice, with an extremely bitter flavour, obtained from the thick fleshy spear-like leaves of several *Aloe* species (*Liliaceae*) natives of Africa, but cultivated in the West Indies. The leaves are cut and the juice caught in a pan as it exudes. It is then heated until it evaporates to a suitable consistency, when it solidifies to a brown resin-like mass on cooling. Nowadays Aloes is packed in boxes, but formerly certain varieties were poured into goat or monkey skins and there allowed to solidify. An example of such a package from Socotra is exhibited.

The long fleshy leaves of Aloes are given strength by the possession of numerous strands of fibre that run throughout their length. These fibres may be separated and twisted into ropes or put to other uses. They are frequently associated with the vascular strands which usually run parallel with one another in the leaves of Monocotyledons. It is not uncommon to find long strong fibres in such leaves and several are the sources of important commercial fibres. In the *Liliaceae*, New Zealand Flax is obtained from the leaves of *Phormium tenax* L.f. (Case A). The commercial fibre is coarse and is employed for binder twine and ropes. Note the Maori cloaks in the entrance hall (Case 16) made from New Zealand Flax.

Manila hemp (Case 7), an important fibre for the manufacture of ropes and cordage, is the product of a banana plant, *Musa textilis* Nees. It is a native of the Philippine Islands where it is grown extensively. Like other bananas (*Musaceae*) it is a herb with the stature of a tree, the trunk of which is formed by the overlapping of a number of fibrous leaf-bases. For fibre production the trunk is cut down before flowering begins, as afterwards the fibres lose some of their strength. Locally, the fibre is plaited and dyed and woven into mats with decorative patterns, but it can be prepared in a form suitable for the most delicate textiles, as shown by a lace-edged handkerchief of Indian workmanship and another from the Philippines with a floral design.

Bananas are better known for their fruits than their fibre. The kind usually imported into Britain is the 'Gros Michel' variety of *Musa sapientum* L. This variety grows to a height of 18 or 20 feet and owes its success largely to the ease with which it can be handled and transported. The fruits are turned back along the stem, so that the great heavy bunches can be laid on their sides without damage. Other kinds such as the dwarf Canary banana, *Musa nana* Loureiro, which grows to a height of about 6 feet, have the clusters of fruit or 'hands' projecting straight out from the stem. With these, the 'hands' must be cut individually from the stem and packed in boxes for transport. This involves much more labour and expense than for the 'Gros Michel', the entire bunches of which can be laid directly into bins in a ship's hold.

The pineapple, *Ananas comosus* (L.) Merr., a native of tropical

South America, is another plant providing both a delicious fruit and a useful fibre. It is now cultivated throughout the tropics for the fruit, much of which is canned and exported. The fibre has only local applications as for the manufacture of hammocks by the Arawak Indians of British Guiana and the delicate muslin-like 'Pina cloth' prepared in the Philippines.

The collection of palms and their products begins in the next small room along the entrance corridor (Room 3) and continues in the large central hall of the building (Room 4). Palm leaves are often very large and either fan-shaped or pinnate with tough leathery leaflets well supplied with fibres. The fan-shaped leaves need little work to convert them into fans. Among those shown is a ceremonial fan used only by chiefs in Fiji prepared from a single leaf of *Pritchardia pacifica* Seem. & Wendl. (Case 20) and others from India made from the Palmyra Palm, *Borassus flabellifer* L. (Table case C) and elaborately painted and decorated. A more important use for the leaves is for thatch. The pinnate leaves of palms are widely employed for this purpose. Sometimes they are merely placed overlapping one another, as in the *Raphia* leaf thatch from Fernando Po (Case 52), or the individual leaflets may be skilfully plaited together to form a leaf tile, as in the example from India made from a coconut leaf (Room 5, Case 64). A similar technique was employed by the Chinese for making rain cloaks from the fan-shaped leaves of the Chusan Palm, *Trachycarpus fortunei* Wendl. (Case 43). A sketch by the famous plant collector Robert Fortune depicts the garment in use.

In glancing through the palm exhibits one is at once struck by the wide range of woven products, from the coarsest basketry to delicate fabrics. All depend upon the exploitation of the fibrous properties of this group of plants, but the technique varies according to the standard of culture of the maker and the purpose for which the object was intended. Some of the articles are the work of tribes still living at the cultural level of the Stone Age, while others convey some idea of the stages through which the craft of weaving has developed up to the beginning of the machine age.

The crudest form of weaving is exemplified by a fishing net from Brazil made from strips of the leaf-stalk of a local palm held together by twists of a slender creeper in its natural state (shelf, centre wall). A shrimp basket from Nigeria (Case 52) uses the same technique, but at a higher level of craftsmanship. Perhaps men first learnt to weave with such stiff pliant material beginning with the simple 'in and out' technique as in the Nigerian shield made of flat strips 2½ inches wide of *Raphia* palm leaf-stalks (Case 52). As skill was acquired, more flexible materials could be used, like the leaves of the Palmyra palm, *Borassus flabellifer* L. First, with coarse strips an inch or so wide, weaving in the flat would give a mat such as that commonly used in India, or in the round, a basket like the fisherman's basket from Madras (Table case C) could be achieved. Then when finer strips could be handled with success more delicate objects would be made and decoration added. So far, all these stages can be seen in articles made from Palmyra leaf. In one direction this type of weaving leads on to matting and thence to fabrics for clothing; in the other, to the various ramifications of the basketry craft.

Some fine examples of mats and hammocks made from the leaves of the Muriti palm, *Mauritia vinifera* Mart. (Table case D) illustrate the first line of development. The simplest application is in the use of strips of leaf, unprepared except by dyeing, shown in the mat from Moyobamba. Then it was found that twisting fine strips gave greater strength, as in the hammock from Trinidad, and that by separating and twisting the leaf-cuticle a softer product was obtained, as in the hammock from Brazil. A hammock from Tomo in Brazil beautifully decorated with feathers (Case 57) is, perhaps, the finest product of this technique. A parallel may be seen in the Malagasy cloths prepared from the leaf-cuticle of the Raphia palm in Madagascar and parts of tropical Africa (Case 50). The coarsest cloths are made from strips up to an eighth of an inch wide, while the better qualities are woven from strips of hair-like fineness. These may be regarded as the highest development of matting as distinct from typical cloth made from twisted fibres. The further stage of applying the twisting and weaving techniques to separated plant fibres leads to modern textiles.

Some primitive types of basket have been referred to already but the finer developments of the simple 'in and out' weave may be seen in Indian and Malaysian work employing rattan canes (Table case B). The Rattans are climbing palms with flexible stems often several hundred feet long and only an inch or two thick. An example of a *Calamus* stem from Ceylon, suspended under the gallery, makes three complete circuits of the hall, and is 369 feet long. The light springy fibrous texture of the rattan stem and its ability to be split in long fine strips makes it an ideal material for basket making. The bamboos are equally good for some types of basket ware, but they are woody grasses. Numerous examples of bamboo baskets and similar ware are exhibited in Room 10 on the first floor.

Another method of basket making, quite distinct from weaving, is to be seen in coiled basket ware. The foundation of the basket may be either a single rod of some flexible material such as a Rattan cane or a Willow rod or a sheaf of grass stems forming a 'pipe'. The foundation 'pipe' is bound round with some flexible fibrous material which may consist of strips of palm leaf, or of bark or *Raphia* leaf-cuticle. As the binding proceeds the pipe is coiled, each turn of the coil being stitched to the next. The method of manufacture will be clear from an examination of the tray made in India from the leaves of *Chamaerops ritchieana* Wendl. (Case 39) and many other examples of this kind of ware may be seen in the cases. In modern times this technique is applied to the manufacture of trays and dinner mats, but it has been used for baskets, hassocks, chairs, beehives and even for water pots. Coiled basket ware is probably as ancient as woven ware. It reached its finest expression among the Indian tribes of south-western United States, where it became the chief outlet for artistic expression of the womenfolk. Imitations of Navajo and Shilo Indian baskets made from rattan cane and *Raphia* leaf-cuticle are exhibited in Case 50.

Plaiting is a technique related to weaving and often used in basketry. The simplest plaits are made from three strands of flexible material, but five, seven and nine are used to give broader bands. Plaits may be woven into baskets to give a decorative effect or the plait may be coiled on itself and the lateral strands looped through the previously made coil in a manner similar to coiled basket ware. This technique can be seen in the fan and hat (Table case A) made in Sicily from leaves of the Dwarf Fan Palm, *Chamaerops humilis* L., and with better workmanship in the baskets of the same material from Portugal and the table mat from Algiers. When a large number of strands are plaited together at once a sleeping mat can be made in one piece (Room 7, cases 83–4). By folding over and sewing the edges together the 'frail' baskets formerly in common use by fishmongers and poulterers were made in Norfolk from the Bulrush, *Scirpus lacustris* L. Other sleeping mats are made in India by linking plaits together side by side as in examples employing wild date palm leaves, *Phoenix sylvestris* Roxb. (Case 37).

When a large number of strands arranged from a centre are plaited together, a circular mat is obtained and a decorative pattern may be introduced by dyeing some of the strands. A fine example made from split leaves of the Silver Thatch palm, *Coccothrinax argentea* Sarg., is exhibited in Table case A. Hats of this material are made by the same technique by altering the tension on the plait which may be done on a mould. Straw hats, which are more familiar to most people, are usually made from the stems or straws of cereal grasses, such as wheat or rye. For this purpose the straw is plaited, five or seven strands often being used to give width, and the plaits are sewn together. Great skill and ingenuity were exercised in the preparation of decorative plaits many examples of which may be seen in Cases 100 and 115 (gallery). Very fine plaits were obtained by splitting the straws or sometimes by using the smaller grasses.

Straw plaiting is only an insignificant by-product of cereal cultivation of which wheat is by far the most important in temperate countries. Modern bread wheats come from *Triticum aestivum* L. (*T. vulgare* Vill.) and a wide range of varieties is exhibited (Cases 111–4) as well as a few of the kinds that were grown in early times in Europe, such as Emmer, *T. dicoccum* Schubler, and Polish wheat *T. polonicum* L. Where the climate is too cold for wheat or the soil too poor, Rye, *Secale cereale* L., is grown (Case 110). Oats, *Avena sativa* L. (Case 104), is grown throughout the wheat belt, but mainly as a fodder crop. In cold, damp localities, where wheat ripens with difficulty, oats compete with rye as a grain cereal, hence the preponderance of oats in Scotland and Scandinavia. Notice the ancient sandstone handmill or quern, from Northern Ireland, for grinding corn (Case 104), and the flail from Suffolk (Case 113) formerly used for threshing wheat.

All the important cereals are represented in this museum. Maize (Cases 88, 89) probably has a shorter association with mankind than some of the other cereals, but has spread to all tropical and subtropical parts of the world. There are several groups of varieties characterised by hardness, mealyness, sugar content and other properties, as Flint corn, Dent corn, Sweet corn and Pop-corn. The male flowers of maize are borne in a tassel at the top of the stem and the female flowers, that give rise to the ears or 'cobs', are enclosed in leaf-sheaths farther down the stem with only their red thread-like stigmas—the 'silk'—protruding. Among the numerous cobs exhibited are some with grains of various colours. Grain colour in maize is a character transmitted from the male parent, so that if a pale-coloured and a dark-coloured variety are crossed the colour of the resulting seeds can be used to distinguish which are hybrids, before they are sown.

A number of small-grained cereals are grown in the tropics several of which are called millets although they are derived from different genera. Common millet, *Panicum miliaceum* L., and Italian millet, *Setaria italica* Beauv. (Case 87), Pearl millet, *Pennisetum spicatum* Roem. & Schult. (Case 85) and Finger millet or Ragi, *Eleusine coracana* Gaertn. (Case 106) are among the more important.

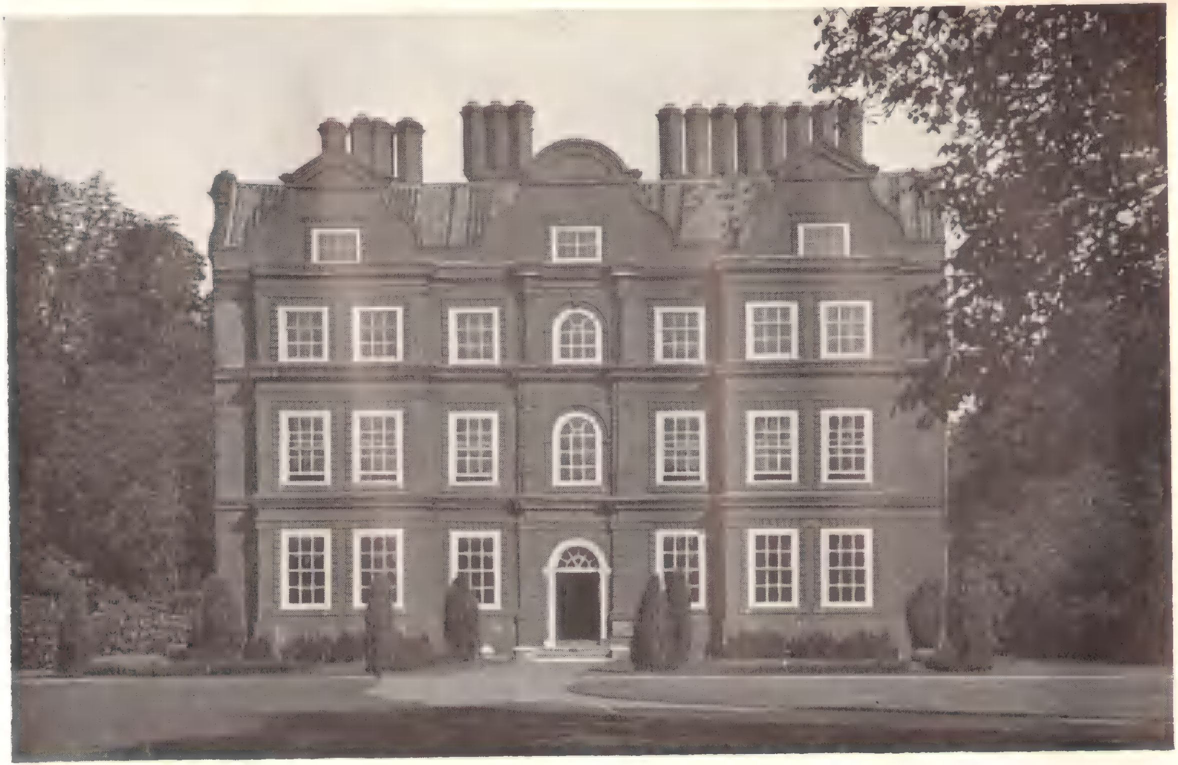
Nor do the cereals exhaust the interest of the grasses. The sugar cane, *Saccharum officinarum* L. (Cases 93, 95–6) is one of the principal sources of sugar, while both it and other grasses, notably Esparto, *Stipa tenacissima* L., are used for paper making. But perhaps enough has been written to stimulate the visitor to seek for himself that wealth of human interest locked up with the plants in the cases of this museum.

MUSEUM No. III (WOOD)

This building, often referred to as Cambridge Cottage, is of historic interest. It was built originally as a private residence and was closely associated with Royalty last century. It was the home of the Cambridge family for many years, being formerly the residence of H.R.H. The Duke of Cambridge. It became a museum in 1910, being devoted at that time to British forestry and forest products. In 1957 its function was changed to that of a general wood or timber museum with special emphasis on Commonwealth timbers, especially those which are imported or used in the wood-working industries of the United Kingdom.

On entering the building it will be noticed that the main or centre room on the ground floor and the passage behind it are devoted to plank specimens while the end room at the east of the building contains hand or case specimens not represented among the larger or plank specimens.

In the entrance hall a number of outstanding specimens are on view, including an exceptionally fine piece of figured Honduras mahogany (*Swietenia macrophylla*). There are also two unusually large and handsome table tops of Amboyna wood (*Pterocarpus indicus*) and Rosewood (*Dalbergia nigra*) cut from a single trunk. Table tops of New Zealand woods are also of special interest. Near the entrance will be seen a section of the trunk of the North American 'Big Wood' or Sequoia (*Sequoia wellingtonia*). This was cut from a tree 276 feet high and over 16 feet in diameter. Much larger trees (up to 30 feet in diameter) are known to exist and such trees are estimated to weigh several hundred tons. The age of the tree from which this specimen was taken was 1,335 years for it shows this number of annual growth rings. It is therefore interesting to reflect that the tree was a sapling at the time of the prophet Mohammed and was already 300 years old when King Alfred was born in 849 A.D. The approximate size of the tree at the time of other important events in British history is indicated by the chart attached to the specimen.



Dutch House, built 1631, popularly known as Kew Palace

On passing into the adjoining room it will be noticed that the timber specimens on view are arranged according to countries. On the north wall are to be seen most of the important timbers derived from West and East Africa. West Africa has long been an important source of commercial hardwood in Britain. Two of the better known West Africa timbers to be seen are African mahogany (*Khaya ivorensis*) and Odum or Iroko (*Chlorophora excelsa*). The latter is much used as a substitute for teak and is well suited for cabinet work and boat construction. Another mahogany-like wood from West Africa is Gedu Nohor (*Entandrophragma angolense*), much used for veneers and in the ship building and motor or bus body trades. Other West African woods to be seen here, which are commonly imported are—African walnut (*Lovoa klainiana*), Opepe (*Nauclea diderrichi*), Dahuma (*Piptadeniastrum africanum*), Niangon (*Tarrietia utilis*) and Agba (*Gossweilerodendron balsamiferum*).

Among the East African timbers represented two of the best known are East African Cedar (*Juniperus procera*) and Podo (*Podocarpus* spp.), the latter resembling good quality pine. Slats of East African cedar for pencil making are exported from East Africa. Other well known East African woods represented by plank specimens are —East African Camphor Wood (*Ocotea usambarensis*), Sapele (*Entandrophragma cylindricum*), Uganda Mahogany (*Khaya anthotheca*) and Muhugu (*Brachylaena hutchinsii*), a hard heavy wood well suited for heavy duty flooring. The wood of *Afzelia quanzensis*, sometimes called 'Rhodesian Mahogany' has in recent years been used with success in high class joinery (staircases, panelled doors), counter tops and fittings, in banks and public buildings.

A number of important hardwoods are imported from the American tropics, notably British Honduras and British Guiana and are to be seen represented by plank and other specimens.What are the world's lightest and heaviest woods are derived from this region, notably Balsa (*Ochroma lagopus:* weight 5–9 lb./cu. ft.) and Lignum Vitae (*Guaiacum officinale:* weight 78–80 lb./cu. ft.). Greenheart (*Ocotea rodiaei*) is a wood of outstanding strength and durability, familiar to many for its use in fishing rods, but also valued for piles, piers, lock-gates and harbour work. Mora (*Mora excelsa*) is another hard, heavy wood of value for piling and heavy constructional work. West Indian Cedar (*Cedrela odorata*) is noted for its fragrance and is the traditional wood for cigar boxes. Purpleheart (*Peltogyne paniculata*) which takes a high polish, is valued for inlay and cabinet work. Other hard, heavy woods from the Guianas to be seen here are Bullet Wood (*Mimusops globosa*), Hoobooballi (*Stryphnodendron* *guianense*), Wallaba (*Eperua falcata*) and Zebra Wood (*Connarus guianensis*).

Among the Asiatic timbers those from Malaya or the Malayan region constitute an interesting series, for the great majority of them belong to one and the same family (*Dipterocarpaceae*). Many are very similar in outward appearance and in working qualities. *Chengal* (*Balanocarpus heimii*), one of the best known timbers of Malaya, is favoured locally for heavy construction and railway sleepers. Merbau or Borneo Teak (*Intsia palembanica*) has similar uses. Among the Malayan woods which are lighter in weight may be seen Meranti (*Shorea acuminata*), Seraya (*Shorea curtisii*) and Jelutong (*Dyera costulata*), the last mentioned being used in pattern making and for battery separators and drawing boards.

Among the woods of the Indian sub-continent are many such as Teak (*Tectona grandis*) and Sandalwood (*Santalum album*) that have long been known in Britain and other western countries. Good examples of these are shown. Teak, supplies of which come largely from Burma and Thailand, is one of the outstanding timbers of the world. It is extensively used in ship building, especially for decking, the oil it contains acting as a preservative. Sandalwood, much used for carving, is scented and is the source of sandalwood oil used in perfumery. Andaman Padouk (*Pterocarpus dalbergioides*) is a handsome wood favoured for furniture, parquet floors, interior decoration and panelling. It has been used in panelling in several large London buildings, e.g. India House. Haldu (*Adina cordifolia*) occurs in many parts of India and Pakistan. It is favoured for turnery, flooring, brush backs, piano keys, bobbins and fancy articles. Champak (*Michelia champaca*) is another wood well known in Pakistan. It is a light wood, resembling American Whitewood (*Liriodendron tulipifera*) and is easily worked.

Satinwood (*Chloroxylon swietenia*) is a characteristic wood of Ceylon with a remarkable lustre and highly esteemed for furniture and cabinet work, also for fancy goods. Ceylon is also noted for its Ebony (*Diospyros ebenum*). The difference between the heartwood and sapwood of Ebony is vividly shown in one of the specimens. Ebony is one of the hardest and heaviest of woods and has a severe blunting effect on tools. It is mainly used for fancy articles and for parts of musical instruments. Jak (*Artocarpus integrifolius*) is perhaps the most extensively used furniture and general purpose wood in Ceylon. It is bright yellow when fresh, is easily worked and polishes well.

At the east end of the room are to be seen woods from Australia and New Zealand. Australia is noted for its wide range of woods belonging to the genus *Eucalyptus*, of which there are several hundred species. Some of the commercially important Eucalyptus woods are here shown, notably Jarrah (*Eucalyptus marginata*), a hard, durable wood much exported in the past, favoured for railway sleepers and heavy construction work. It is sometimes used in the United Kingdom for counter tops. Karri (*Eucalyptus diversicolor*) is a somewhat similar wood, trees reaching 200 feet in height and 10 feet in diameter in Western Australia. Blackwood (*Acacia melanoxylon*), which occurs from Queensland to Tasmania, is one of Australia's most valuable timbers, being esteemed for furniture and high class joinery (banks, offices and railway carriages). The Kauri (*Agathis australis*), a magnificent tree of the New Zealand forests, yields a strong durable wood, straight grained and free of knots. It has been much used for masts, constructional work, spirit vats and other purposes. Rimu or 'Red Pine' (*Dacrydium cupressinum*) is perhaps the principal indigenous timber of New Zealand where it has been much used in house building and for furniture.

North American and Canadian timbers are to be seen on the south side of the room. Notable among them are several species of North American pine the timber of which is imported into the British Isles. Another Canadian wood held in high esteem in Britain is Western Red Cedar (*Thuja plicata*). It is singularly resistant to decay and is favoured for out-door work, e.g., greenhouses, garden frames, beehives, etc. A garden shelter made from this wood is in front of this museum. Another much used Canadian wood in Britain is Douglas Fir (*Pseudotsuga menziesii*), also called Colombian Pine or Oregon Pine. Canadian or American Ash (*Fraxinus americana*) esteemed for its toughness, is much used in the automobile and agricultural implement industries. It is to be seen on the body work of many of the 'estate cars' that are now popular.

British or home-grown timbers are well represented in the passage adjoining the entrance hall and centre room. Here plank specimens of all the commercial timbers produced in the British Isles are to be seen, one side of the passage being devoted to hardwoods and the other to softwoods or Coniferous woods. Among the hardwoods such well known timbers as Oak, Beech, Elm, Ash, Sycamore, Alder, Birch, Chestnut, Box, Poplar and Willow are to be seen. The Conifers are represented by various species of Pine (*Pinus*), Fir (*Abies*), Spruce (*Picea*), Larch (*Larix*), Cypress (*Cupressus*) and Yew (*Taxus baccata*).

In the east room or the room overlooking the Herb Garden are a number of special exhibits. There are also hand specimens of commercial timbers which are not represented among the plank specimens, these being arranged geographically in the upright cases. One of the upright cases (next the south door) is concerned with the subject of growth rings or annual rings in wood. Exceptionally wide growth rings are well illustrated in a specimen of eight year old pine (*Pinus radiata*) grown in New Zealand where the rings are over an inch apart. Other woods illustrate extremely close or small growth rings. A series of specimens of European Larch (*Larix decidua*) demonstrates the extremes that may occur in one and the same species with trees grown under favourable and unfavourable conditions. A cross section of oak, with a horse shoe embedded in it, the growth rings having completely surrounded it, is probably the result of the horse shoe having been placed on the tree when the tree was young.

In one of the table cases various woods favoured in the making of weapons of various kinds are shown. There is also an exhibit devoted to the use of home grown wood as fuel, the relative value of different English woods as firewood being indicated.

Other special exhibits (in the upright cases on the east wall) are devoted to burrs in wood, 'the old and the new in wood carving' and a fine range of veneers as used for interior decoration in the liner *Queen Mary*.

The up-stairs rooms of this museum are in the main devoted to specimens illustrating some of the many uses of wood. One room is largely devoted to the pests and diseases that commonly attack wood or timber trees in the British Isles.

Floral Seasons

FEBRUARY	Snowdrops
MARCH	Crocuses
MARCH TO APRIL	Orchids
EARLY APRIL	Daffodils
MID APRIL TO EARLY MAY	Magnolias
LATE APRIL TO EARLY MAY	Cherries
LATE MAY	Bluebells
LATE MAY TO EARLY JUNE	Rhododendrons Azaleas Irises
OCTOBER	Autumn Tints

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GENERAL INFORMATION

The Gardens are open daily (except Christmas Day) from 10 a.m. The closing hour varies from 4 p.m. in midwinter to 8 p.m. in midsummer.

The Houses and Museums are open daily from 1 p.m.; they close ten minutes before closing time during the winter but are never open after 4.50 p.m. on a week-day or 5.50 p.m. on a Sunday. The Alpine House is open in the mornings from 10 a.m. to mid-day and 1 p.m. to closing time.

CHARGES FOR ADMISSION

Visitors	3d.
Perambulators or invalid chairs . .	3d. (by ticket admitting occupant and attendant).
*Sketching or Photographic apparatus	Free.
†School Parties (including a teacher or teachers)	Free (Mondays to Fridays only).

Season tickets, available for 12 months, may be obtained on application to the Director, at the price of £1. They are not transferable, and may be revoked at the discretion of the Ministry of Agriculture, Fisheries and Food.

Invalid Chairs and Perambulators should not be taken on the lawns, and must not be taken into any buildings without prior permission.

It is particularly requested that visitors will abstain from handling plants or specimens.

* It is not permitted to take photographs of persons or groups of persons. Entry to buildings or enclosures marked "Private" is forbidden. Sketching and photography in the houses are allowed by permit only on the afternoons of Fridays.

† By voucher obtainable on written application to the Director. Four days' notice must be given.

Dogs are not admitted in any circumstances.

Invalid Chairs, to a limited number, may be hired officially, on adequate notice being given.

Refreshments can be obtained at the Refreshment Pavilion in the Gardens during the summer season (approx. beginning of April to end of September). Application for special terms for parties, etc., should be made direct to the Manager. There are several Restaurants on Kew Green, and others close to the Cumberland and Victoria Gates.

Transport.—The Royal Botanic Gardens are situated on bus routes 27, 27a, 65, 265, 270, and 15—which operates on Sundays only. The nearest stations are Kew Gardens (District Line), five minutes' walk from Victoria Gate, and Kew Bridge (Southern Line) on the other side of the Thames, about ten minutes distance from the Main Gate.

Lavatories.—For Ladies: (1) near Orangery, (2) east of the Lily Pond, (3) east of the Tea Pavilion, (4) east of the Pond.

For Gentlemen: (1) behind Orangery, (2) near Brentford Gate, (3) east of Tea Pavilion, (4) just south of Cumberland Gate, (5) near Victoria Gate, (6) east of the Lily Pond.

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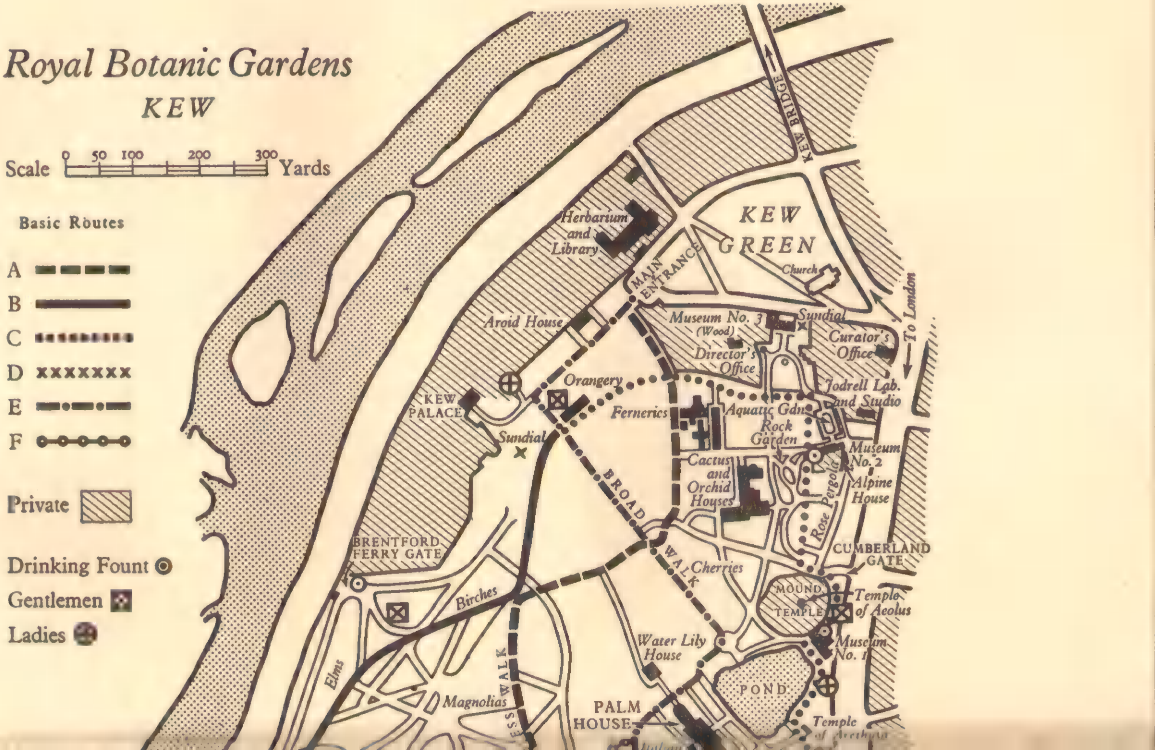

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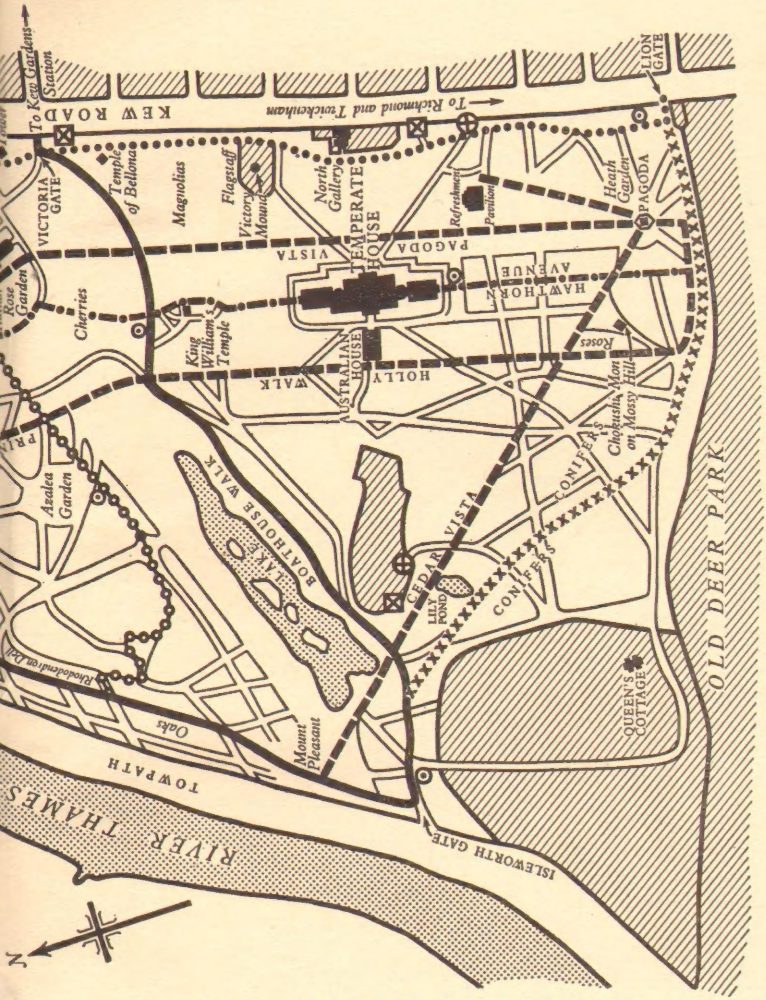
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PAGODA
PAGODA VISTA
HAWTHORN AVENUE
Rose Garden
Cherries
King William's Temple
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Roses
Chokushi Mon on Mossy Hill
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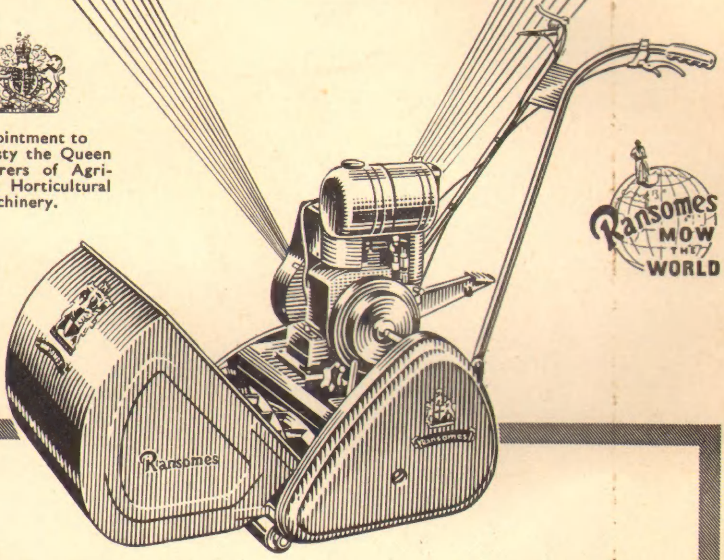

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